L Number	Hits	Search Text	DB	Time stamp
1	10	(("6278988") or ("6343327") or ("5797015") or ("5448490") or ("5777883")).PN.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2002/09/29 21:10
2	1306	((53/474,157) or (700/220,222) or (709/239)).CCLS.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2002/09/29 21:11
3	376	(53/157).CCLS.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2002/09/29 21:20
4	90437	((53/$) or (700/$) or (709/$)).CCLS.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2002/09/29 21:16
6	228	(((53/$) or (700/$) or (709/$)).CCLS.) and "monitor performance"	USPAT; US-PGPUB; EPO; JPO; DERWENT	2002/09/29 21:17
7	0	((((53/$) or (700/$) or (709/$)).CCLS.) and "data capture") and (((53/474,157) or (700/220,222) or (709/239)).CCLS.)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2002/09/29 21:18
8	3	((((53/$) or (700/$) or (709/$)).CCLS.) and "monitor performance") and (((53/474,157) or (700/220,222) or (709/239)).CCLS.)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2002/09/29 21:18
5	179	(((53/$) or (700/$) or (709/$)).CCLS.) and "data capture"	USPAT; US-PGPUB; EPO; JPO; DERWENT	2002/09/29 21:19

US006343327B2

(12) **United States Patent**
Daniels, Jr. et al.

(10) **Patent No.: US 6,343,327 B2**
(45) **Date of Patent: *Jan. 29, 2002**

(54) **SYSTEM AND METHOD FOR ELECTRONIC AND PHYSICAL MASS MAILING**

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(73) Assignee: **Pitney Bowes Inc.**, Stamford, CT (US)

(*) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **08/968,649**

(22) Filed: **Nov. 12, 1997**

(51) **Int. Cl.**[7] **G06F 13/14**
(52) **U.S. Cl.** **709/239**; 345/335
(58) **Field of Search** 395/200.49; 345/335; 358/402, 4.3; 709/238, 239, 240; 382/137

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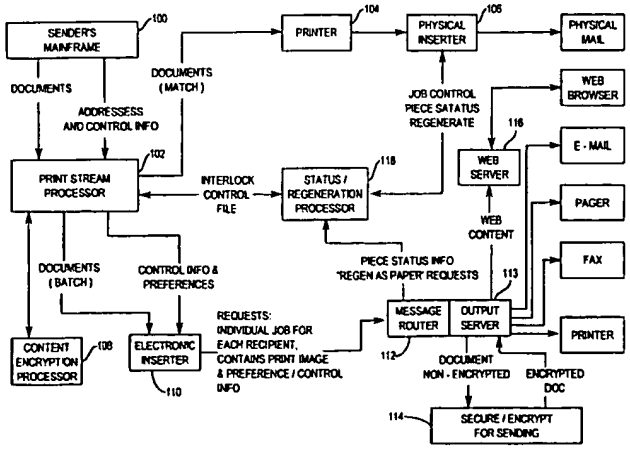
Primary Examiner—Von J. Couso
(74) *Attorney, Agent, or Firm*—Michael J. Cummings; Christopher J. Capelli; Michael E. Melton

(57) **ABSTRACT**

A printstream processor separates documents, e.g. in a printstream or batch, into a physical delivery printstream and an electronic delivery printstream based on delivery preferences stored in a database. The documents in the physical delivery printstream are printed and combined with physical inserts for physical delivery, e.g. by the U.S. Postal Server. The documents in the electronic delivery printstream are combined with electronic inserts for electronic delivery, for example, via electronic mail, facsimile, pager, or to a server on World Wide Web.

30 Claims, 6 Drawing Sheets



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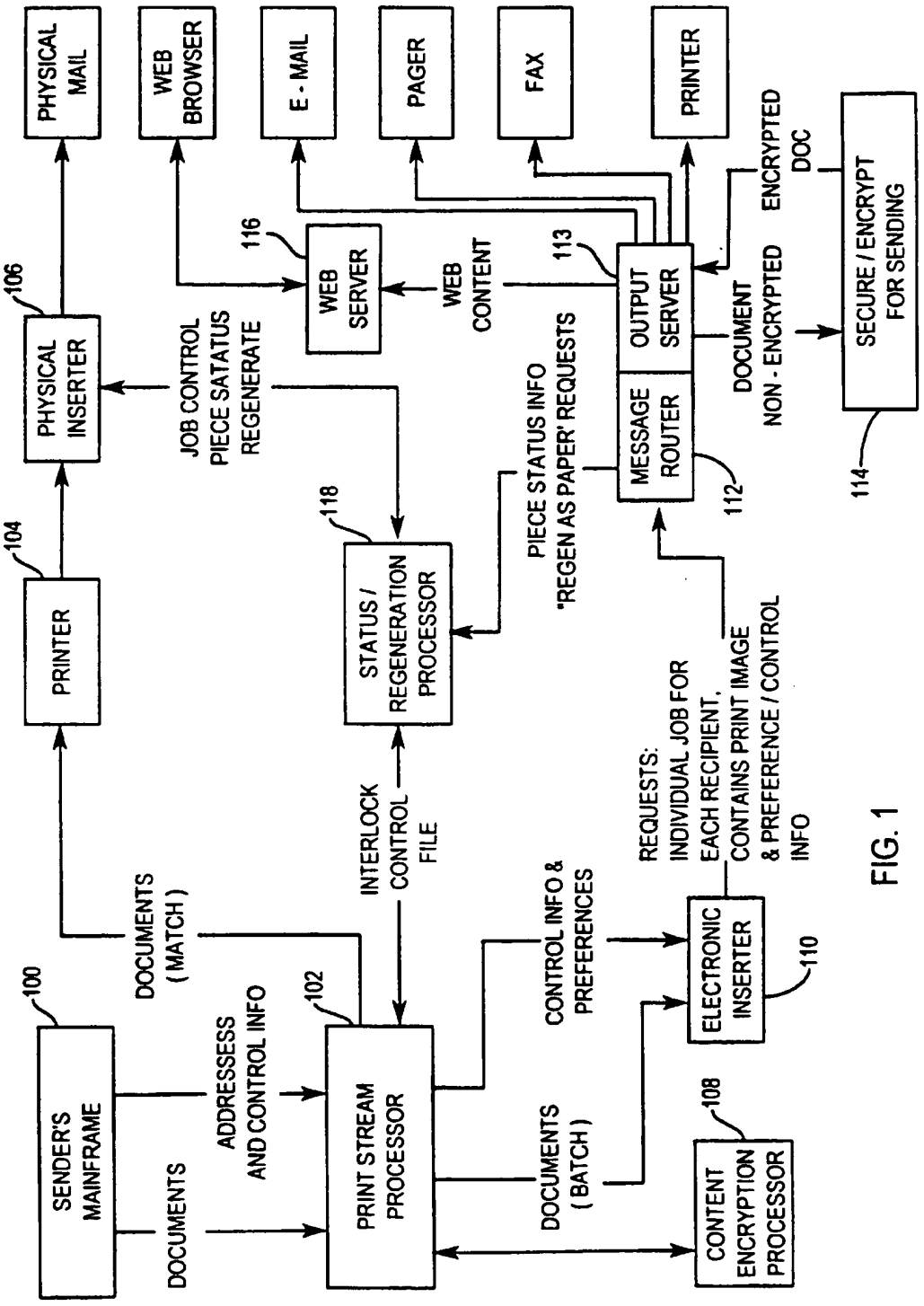
PHYSICAL MAIL
WEB BROWSER
E - MAIL
PAGER
FAX
PRINTER
ENCRYPTED DOC
116
WEB SERVER
WEB CONTENT
113
OUTPUT SERVER
106
PHYSICAL INSERTER
JOB CONTROL
PIECE SATATUS
REGENERATE
DOCUMENT
NON - ENCRYPTED
SECURE / ENCRYPT FOR SENDING
MESSAGE ROUTER
112
114
PIECE STATUS INFO
"REGEN AS PAPER' REQUESTS
118
104
PRINTER
STATUS / REGENERATION PROCESSOR
REQUESTS:
INDIVIDUAL JOB FOR
EACH RECIPIENT,
CONTAINS PRINT IMAGE
& PREFERENCE / CONTROL
INFO
DOCUMENTS
(MATCH)
INTERLOCK
CONTROL
FILE
CONTROL INFO &
PREFERENCES
ELECTRONIC INSERTER
110
100
SENDER'S MAINFRAME
ADDRESSES
AND CONTROL INFO
102
PRINT STREAM PROCESSOR
DOCUMENTS
DOCUMENTS
(BATCH)
108
CONTENT ENCRYPTION PROCESSOR

FIG. 1

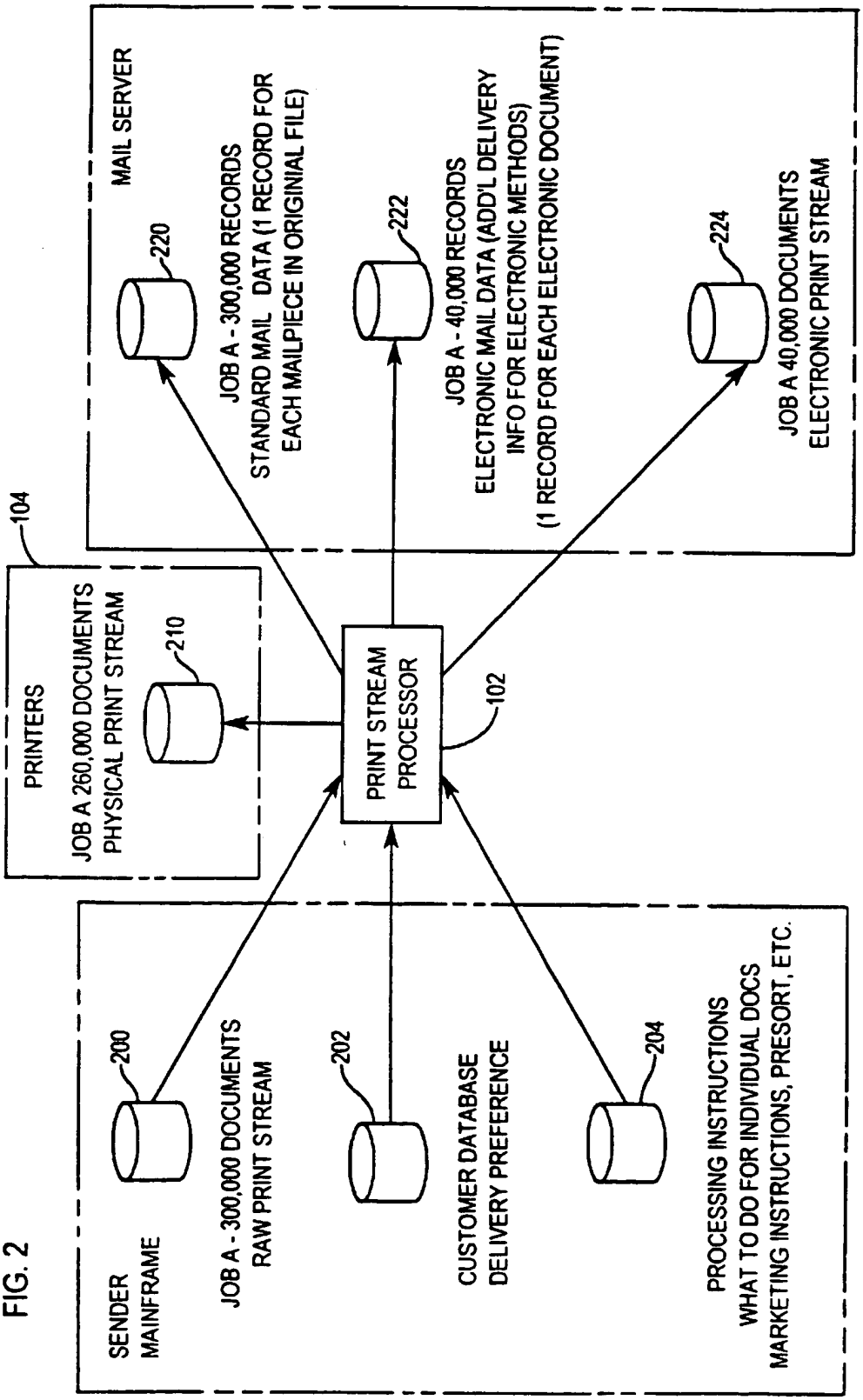
MAIL SERVER
220
JOB A - 300,000 RECORDS
STANDARD MAIL DATA (1 RECORD FOR
EACH MAILPIECE IN ORIGINIAL FILE)
222
JOB A - 40,000 RECORDS
ELECTRONIC MAIL DATA (ADD'L DELIVERY
INFO FOR ELECTRONIC METHODS)
(1 RECORD FOR EACH ELECTRONIC DOCUMENT)
224
JOB A 40,000 DOCUMENTS
ELECTRONIC PRINT STREAM
104
PRINTERS
JOB A 260,000 DOCUMENTS
PHYSICAL PRINT STREAM
210
PRINT STREAM
PROCESSOR
102
SENDER
MAINFRAME
200
JOB A - 300,000 DOCUMENTS
RAW PRINT STREAM
202
CUSTOMER DATABASE
DELIVERY PREFERENCE
204
PROCESSING INSTRUCTIONS
WHAT TO DO FOR INDIVIDUAL DOCS
MARKETING INSTRUCTIONS, PRESORT, ETC.

FIG. 2

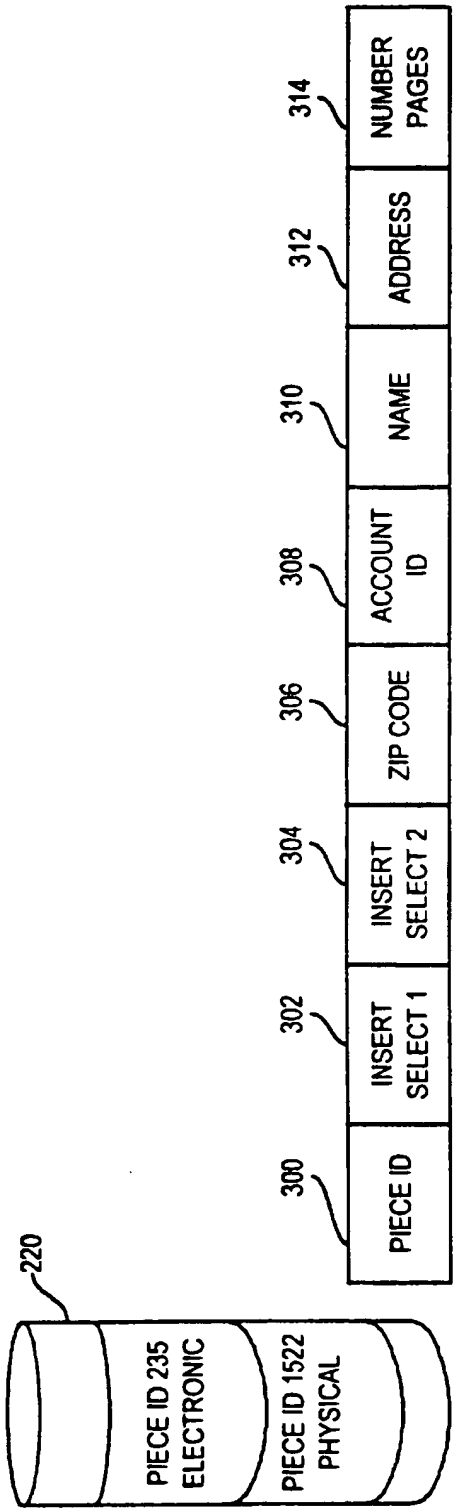

FIG. 3A
(STANDARD MAIL DATA)

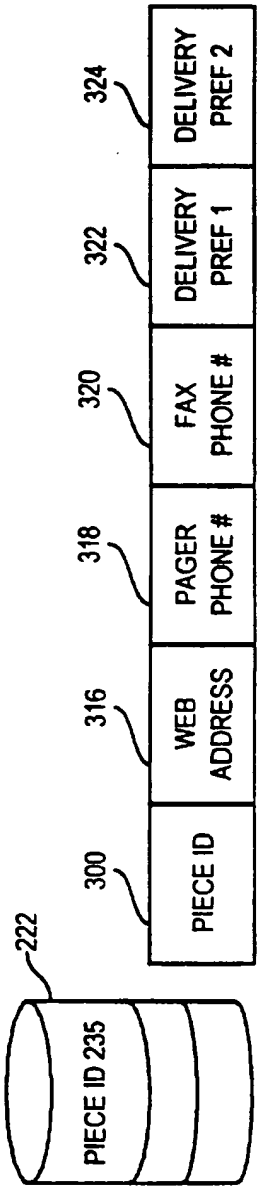

FIG. 3B
(ADDITIONAL ELECTRONIC DELIVERY DATA)

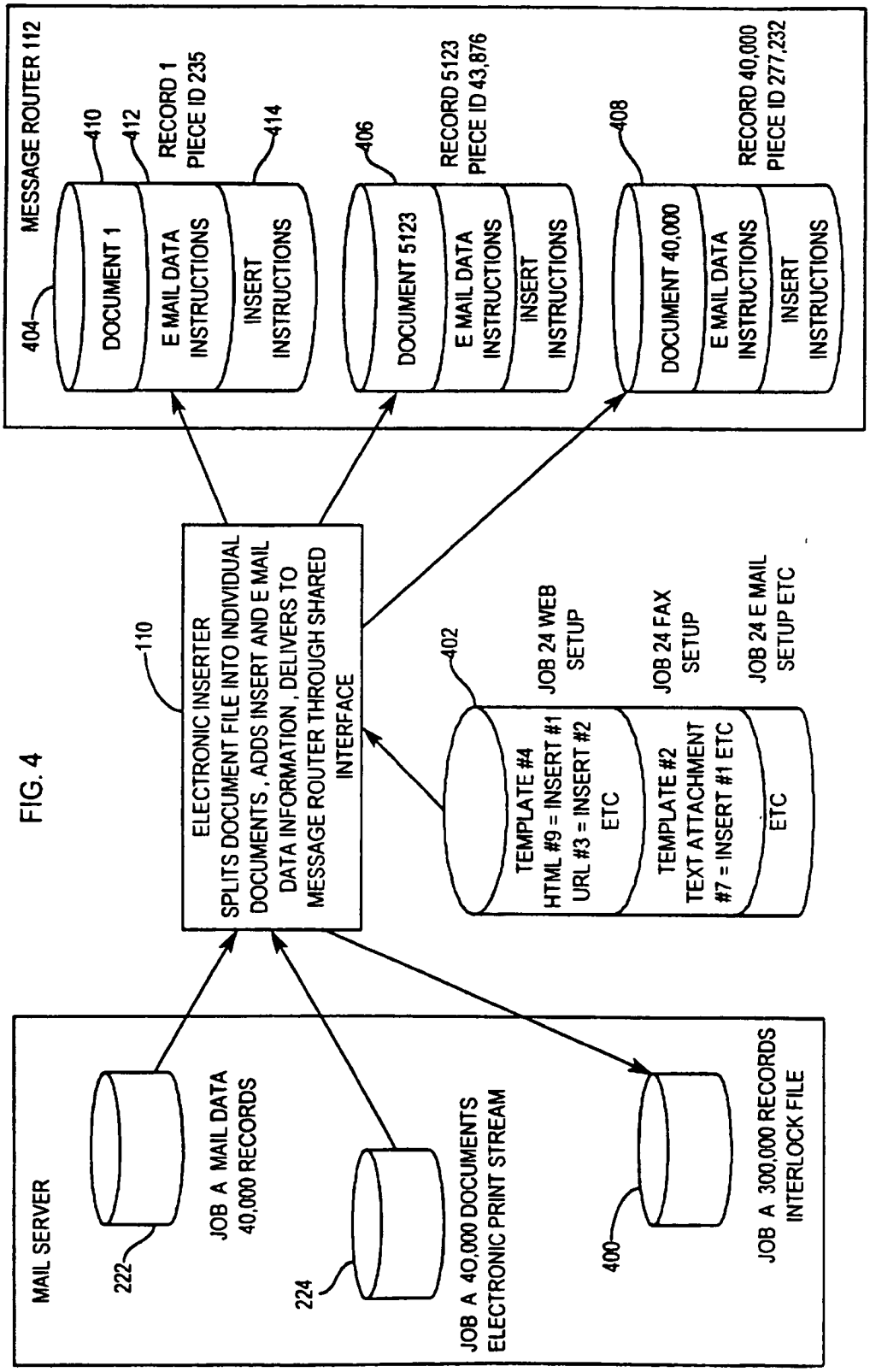
MESSAGE ROUTER 112
404
410
412
414
406
408
DOCUMENT 1
E MAIL DATA INSTRUCTIONS
INSERT INSTRUCTIONS
RECORD 1 PIECE ID 235
DOCUMENT 5123
RECORD 5123 PIECE ID 43,876
DOCUMENT 40,000
RECORD 40,000 PIECE ID 277,232
110
ELECTRONIC INSERTER SPLITS DOCUMENT FILE INTO INDIVIDUAL DOCUMENTS , ADDS INSERT AND E MAIL DATA INFORMATION , DELIVERS TO MESSAGE ROUTER THROUGH SHARED INTERFACE
402
TEMPLATE #4 HTML #9 = INSERT #1 URL #3 = INSERT #2 ETC
JOB 24 WEB SETUP
TEMPLATE #2 TEXT ATTACHMENT #7 = INSERT #1 ETC
JOB 24 FAX SETUP
ETC
JOB 24 E MAIL SETUP ETC
MAIL SERVER
222
JOB A MAIL DATA 40,000 RECORDS
224
JOB A 40,000 DOCUMENTS ELECTRONIC PRINT STREAM
400
JOB A 300,000 RECORDS INTERLOCK FILE

FIG. 4

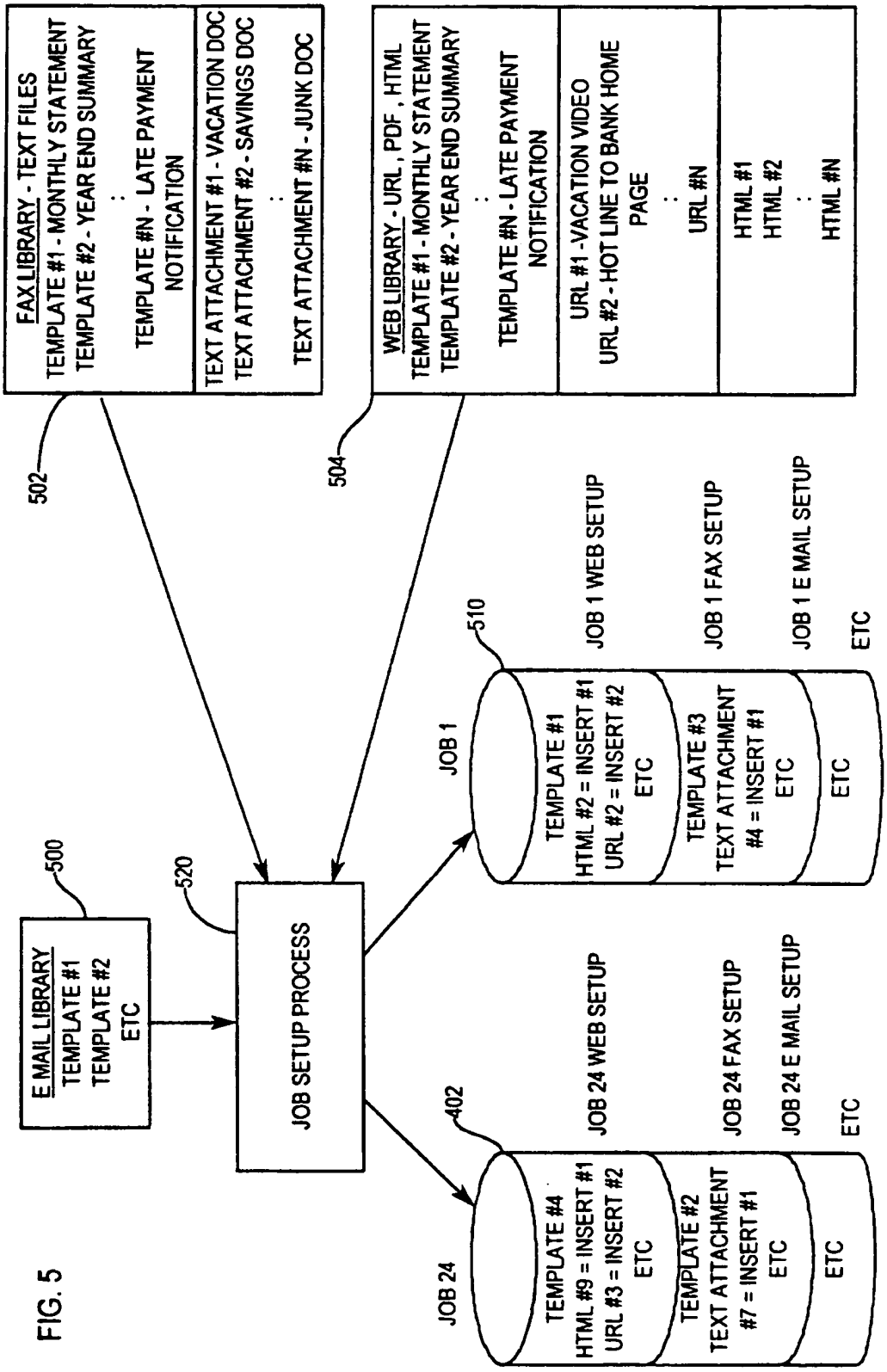
FAX LIBRARY - TEXT FILES
TEMPLATE #1 - MONTHLY STATEMENT
TEMPLATE #2 - YEAR END SUMMARY
:
TEMPLATE #N - LATE PAYMENT NOTIFICATION
TEXT ATTACHMENT #1 - VACATION DOC
TEXT ATTACHMENT #2 - SAVINGS DOC
:
TEXT ATTACHMENT #N - JUNK DOC
502
WEB LIBRARY - URL, PDF, HTML
TEMPLATE #1 - MONTHLY STATEMENT
TEMPLATE #2 - YEAR END SUMMARY
:
TEMPLATE #N - LATE PAYMENT NOTIFICATION
URL #1 - VACATION VIDEO
URL #2 - HOT LINE TO BANK HOME PAGE
:
URL #N
HTML #1
HTML #2
:
HTML #N
504
E MAIL LIBRARY
TEMPLATE #1
TEMPLATE #2
ETC
500
520
JOB SETUP PROCESS
JOB 1
510
TEMPLATE #1
HTML #2 = INSERT #1
URL #2 = INSERT #2
ETC
TEMPLATE #3
TEXT ATTACHMENT
#4 = INSERT #1
ETC
ETC
JOB 1 WEB SETUP
JOB 1 FAX SETUP
JOB 1 E MAIL SETUP
ETC
JOB 24
402
TEMPLATE #4
HTML #9 = INSERT #1
URL #3 = INSERT #2
ETC
TEMPLATE #2
TEXT ATTACHMENT
#7 = INSERT #1
ETC
ETC
JOB 24 WEB SETUP
JOB 24 FAX SETUP
JOB 24 E MAIL SETUP
ETC

FIG. 5

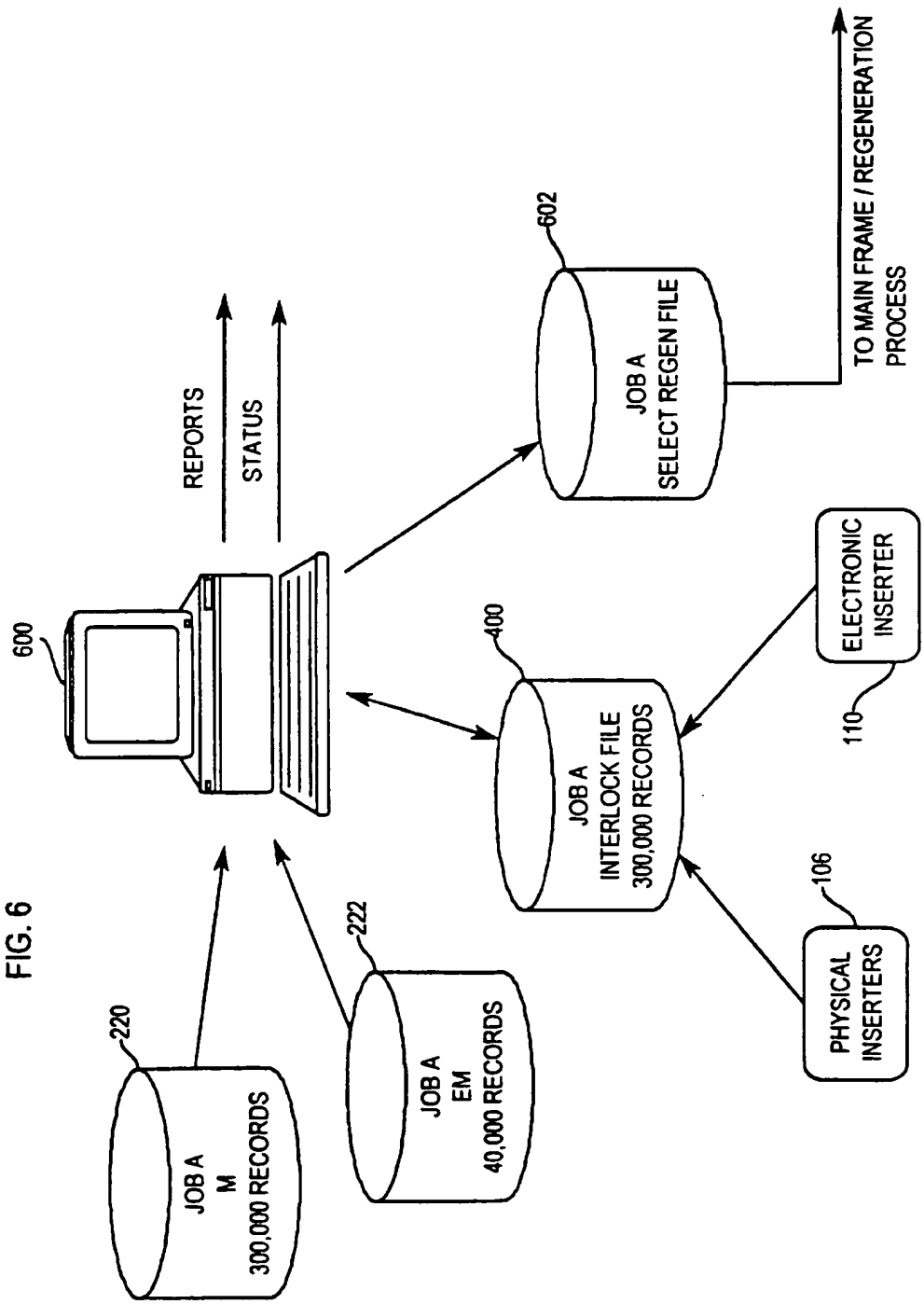
600
REPORTS
STATUS
602
JOB A
SELECT REGEN FILE
TO MAIN FRAME / REGENERATION PROCESS
400
JOB A
INTERLOCK FILE
300,000 RECORDS
ELECTRONIC INSERTER
110
106
PHYSICAL INSERTERS
222
JOB A
EM
40,000 RECORDS
220
JOB A
M
300,000 RECORDS

FIG. 6

SYSTEM AND METHOD FOR ELECTRONIC AND PHYSICAL MASS MAILING

TECHNICAL FIELD

The present invention relates to mass mail delivery mechanisms and, more particularly, to combined electronic and physical delivery mechanisms.

BACKGROUND ART

Many businesses currently send out mass mailings to their customers or prospective customers. For example, a utility, e.g. electric company, may send out hundreds of thousands of bills to its customers every month. As another example, a company may wish to send targeted marketing material, such as a sales letter, to prospective customers on a mailing list. In either example, a company may augment the bill or basic sales letter with additional material called "inserts," for example, a brochure or a glossy advertisement.

There currently exist computer systems, software, and specialized peripherals for producing mass mailings for physical delivery, e.g. through the U.S. Postal Service or by courier. With the advent of new forms of electronic mail delivery, however, it is becoming more desirable to augment existing mass mailing capability with electronic delivery mechanisms, such as by electronic mail (email), facsimile, pager, or publication to a page on the World Wide Web. However, there are many reasons why it is difficult to upgrade or replace these computers systems for electronic mail delivery.

Often these computer systems are called "legacy" computer systems because they are relatively old computer systems handed down from previous generations of company management. These legacy computer systems, however, are still effective and often control processing vital to the company's business, e.g. bill production. Such legacy systems for mass mailing document production typically run on a mainframe computer and are complex and expensive. Accordingly, companies are reluctant to modify, upgrade, or replace these critical document generation applications.

Another reason why upgrading a business application is difficult is that the business application is written by a third-party developer with exclusive access to the source code and unwilling or unable to upgrade the application. For example, the business application may have been written by a company that has gone out of business or discontinued support for that application.

Even if a company has access to the source code of its mass mailing application, the company may not have the resources in terms of time or programming staff to make the necessary modifications for electronic mail delivery.

As an additional complication, electronic mail delivery may take a variety of forms, e.g. email, facsimile, pager. Each electronic delivery mechanism imposes restrictions on the nature of inserts added to the mailing. For example, an alphanumeric pager can only receive a small number of characters.

DISCLOSURE OF THE INVENTION

There exists a need for adding capabilities of electronic mail delivery to existing mass mailing systems. There is also a need for handling inserts in a manner appropriate to the delivery mechanism.

These and other needs are met by an electronic delivery system and method in which a printstream processor separates documents into a physical delivery printstream and an electronic delivery printstream based on delivery preferences stored in a database. A printer prints the physical delivery printstream to create printed documents. A physical inserter generates physical mail pieces including one of the printed documents and, for at least some of the physical mail pieces, respective physical inserts. An electronic inserter splits the electronic delivery printstream into electronic documents and generates electronic mail pieces. Each of the electronic mail pieces includes one of the electronic documents and, for at least some of the electronic mail pieces, an electronic insert. The electronic insert may be a link to a World Wide Web site, a text attachment, a document, or an electronic copy of a physical insert.

A message router delivers the electronic mail pieces via an electronic delivery mechanism specified in the delivery preferences, e.g. to a web server, an electronic mail address, a pager, a facsimile machine, and a printer. Preferably, the message router is configured to deliver an electronic mail piece by one electronic delivery mechanism and a notification message by another electronic delivery mechanism. The system may include a regeneration processor for causing a physical mail piece to be generated, corresponding to an electronic mail piece that has not been delivered.

Another aspect of the invention is a method of mass mailing in which a first batch of print images is received. The method includes determining whether or not each print image is to be delivered physically, in which case the print image is stored in a second batch, or electronically, in which case the print image is stored in a third batch. Preferably, first records indicating a physical delivery address is stored for all the print images of the first batch, and second records indicating an electronic delivery address is stored for all the print images of the third batch.

The software aspects encompass media or carrier waves bearing sequences of computer executable instructions for performing the steps of the invention. A computer readable medium, as used herein, may be any medium that can bear instructions or code for performing a sequence of steps in a machine readable form, such as a floppy disk, flexible disk, hard disk, magnetic tape, any other magnetic medium, a CD-ROM, an other optical medium, a RAM, ROM, PROM, EPROM, FLASH-EPROM, and any other memory chip or cartridge. A carrier wave signal is any type of signal that may carry digital information representative of the instructions or code for performing a sequence of steps. Such a carrier wave may be received via a network, over a modem, or as a radio-frequency or infrared signal, or any other type of signal which a computer may receive and decode.

Additional objects, advantages, and novel features of the present invention will be set forth in part in the detailed description which follows, and in part will become apparent upon examination or may be learned by practice of the invention. The objects and advantages of the invention may be realized and obtained by means of the instrumentality's and combinations particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF DRAWINGS

The present invention is illustrated by way of example and not by limitation, in the figures of the accompanying drawings, wherein elements having the same reference numeral designations represent like elements throughout and wherein:

FIG. 1 is a diagram of the printstream delivery architecture according to an embodiment.

FIG. 2 is an input/output diagram of a printstream processor according to an embodiment.

FIGS. 3A and 3B are diagrams showing the format of records of the mail run datafile and of the electronic mail run datafile according to an embodiment.

FIG. 4 is an input/output diagram of an electronic inserter according to an embodiment.

FIG. 5 is an input/output diagram of a job setup process according to an embodiment.

FIG. 6 is an input/output diagram of a regeneration processor according to an embodiment.

BEST MODE FOR CARRYING OUT THE INVENTION

A system and method of physical and electronic printstream delivery are described. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be apparent, however, that the present invention may be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form in order to avoid unnecessarily obscuring the present invention.

Printstream Delivery Architecture Overview

FIG. 1 depicts a printstream delivery architecture according to an embodiment of the present invention. A user at a sender's mainframe **100** submits to printstream processor **102** documents in a printstream, addressing information in the form of delivery preferences stored in a database, and control information specifying, e.g., what inserts are to be included with each document in the printstream.

A printstream may be a batch of documents or print images of documents produced by a third-party or legacy business application. For example, a billing system may produce a batch of bills that are to be printed and sent to each customer. By employing a printstream processor **102** as a post processor with supplemental addressing and control information outside of the business application that produced the printstream, the functionality of the business application can be extended without change to the business application.

Printstream processor **102** splits the submitted printstream into one of two printstreams based on the addressing information in the delivery preferences. One printstream is a physical delivery printstream, in which the documents are to be delivered, as specified in the addressing information, to a physical address via a physical delivery mechanism, for example, the U.S. Postal Service or a courier service. The other printstream is an electronic delivery printstream, in which the documents are to be delivered via an electronic delivery mechanism, e.g. the electronic mail or facsimile, as specified in the delivery preferences. Printstream processor **102** may encrypt the documents with a content encryption processor **108**.

The physical delivery printstream is sent from the printstream processor **102** to a printer **104** where the documents in the physical delivery printstream are printed on a tangible medium such as paper. The printed documents are sent to a physical inserter **106** where they are processed into physical mail pieces. For example, a physical mail piece may contain a properly addressed envelope with the proper postage and stuffed with the printed document. In addition, the envelope may include additional printed matter, called physical inserts, selected according to criteria in the control information. The physical mail pieces are then ready for delivery by traditional means, e.g. through the U.S. Postal Service.

The electronic delivery printstream is sent to an electronic inserter **110**, which separates out the individual documents in the electronic delivery printstream and combines the document with the appropriate electronic insert based on the control information to produce an electronic mail piece. Moreover, the nature of the electronic insert is tailored to the particular electronic delivery mechanism specified in the addressing information. For example, an insert for a facsimile delivery is another document faxed along with the individual document. As another example, delivery to a World Wide Web site involves an insert which is a link specifying the URL (Uniform Resource Location) of another page on the World Wide Web.

The separate electronic mail pieces are sent to message router **112** for delivery to the delivery mechanism specified in the addressing information, e.g. to a web server **116**, electronic mail address, pager, facsimile machine, or a networked printer. The message router **112** is configured to send a separate notification via another delivery mechanism. For example, message router **112** may deliver an electronic mail piece to a web server **116** and send the recipient a generic fax that informs the recipient of the delivery to the web server **116**. In addition, message router **112** may encrypt or otherwise provide for security of the outgoing electronic mail piece via security module **114**.

If the electronic mail piece is not delivered after a certain length of time, the message router **112** generates and sends a "failed to process" or "failed to deliver" message to status/regeneration processor **118**, which (depending on the users configured system, which system is configurable) may cause a physical version of the undelivered electronic mail piece to be produced by printer **104** and physical inserter **106** and delivery by physical means.

Printstream Processor

Exemplary input and output of printstream processor **102** is illustrated in FIG. 2. A user at a mainframe may submit to the printstream processor **102** a job "A" comprising 300,000 documents in a raw printstream **200**. This raw printstream **200** may be the output of a legacy application executing on the mainframe. The printstream processor **102** may be an application executing on the same mainframe or an application executing on another computer, e.g. a workstation or PC, networked to the mainframe.

The printstream processor **102** utilizes a customer database **202** of delivery preferences that indicate how each document for each recipient is to be delivered, e.g. physically, by fax, etc. Control information **204** is also input to printstream processor **102** to specify processing instructions, for example, which inserts are to be included and whether to presort the documents.

Printstream processor **102** separates the raw printstream into two printstreams, one for physical delivery and another for electronic delivery. In the example depicted in FIG. 2, printstream processor **102** separates raw printstream **200** into a physical delivery printstream **210** comprising 260,000 documents. Physical delivery printstream **210** is sent to printer **104** for the next step in the physical delivery process. The other printstream is electronic delivery printstream **224** comprising the remaining 40,000 documents of the raw printstream **200**. Electronic delivery printstream **224** is sent to electronic inserter **110** for the next step in the electronic delivery process.

Printstream processor **102** also produces two datafiles, mail run datafile **220** and electronic mail run datafile **222**. Mail run datafile **220** contains one record for every docu-

ment in the original raw printstream **200**. The contents of each record in mail run datafile **220** is illustrated in FIG. **3**. Each mail run datafile **220** record includes a piece identifier **300**, which may specify the sort order of the documents. In addition, each record may contain one or two insert selections **302** and **304**, which specify the insert(s) that may be included with the respective document. For example, an insert selection **302** for a physical mail piece may be a brochure describing a ski resort in Vermont. The mail run datafile **220** record also includes such physical delivery information as a ZIP code **306**, an account identifier **308**, a name **310**, an address **312**, and a number of pages **314** for the document. The mail run datafile **220** is used by the printer **104** and physical inserter **106** for generating physical mail pieces with the selected inserts and the proper physical mail address.

If a mail piece is to be delivered by electronic means, as specified in the customer database **202** of delivery preferences, the printstream processor **200** creates a record in the electronic mail run datafile **222** in parallel to the mail run datafile **220**. Thus, the tenth record in electronic mail run datafile **222** corresponds to the tenth electronic mail piece in electronic delivery printstream **224**. Each of the electronic mail run datafile **222** records contain a piece identifier **300**, in order to match up with the corresponding record in the mail run datafile **220**. The records also contain electronic delivery information derived from the customer database **202** such as a Web address or URL **316**, a pager telephone number **318**, and a fax number **320**. In addition, the records contain delivery and notification preferences **322** and **324**, to specify which delivery option is to be given priority. As described in more detail hereinafter, the electronic delivery information in records of the electronic mail run datafile **222** is attached to the respective electronic mail piece by electronic inserter **110** for delivery by message router **112**.

Although mail run datafile **220** contains information mainly for physical delivery, all documents to be delivered electronically have a corresponding entry in mail run datafile **220** in case the mail piece has to be delivered physically. Electronic mail pieces may require physical delivery, via regeneration processor **118** described in more detail hereinafter, if the electronic delivery mechanisms do not successfully deliver the electronic mail piece. For example, electronic mail piece **235** in FIG. **3** has a record in both mail run datafile **220** and electronic mail run datafile **222**.

Electronic Inserter

As depicted in FIG. **4**, electronic inserter **110** splits the electronic delivery printstream **224** into individual electronic mail pieces and packages them with an insert appropriate for the electronic delivery mechanism specified for the electronic mail pieces. Electronic inserter **110** is preferably a computer software application, which may be executed on the same computer as the printstream processor **102** or another computer on the same network.

FIG. **4** depicts three electronic mail pieces **404**, **406**, and **408**, which may be produced by electronic inserter **110**. Each electronic mail piece, e.g. piece **404**, comprises a document **410** obtained from electronic delivery printstream **224**, which was split from raw printstream **200** by printstream processor **102**. The electronic mail piece also includes electronic mail data instructions **412** derived from the corresponding record in the electronic mail run datafile **222**, and insert instructions **404** derived from job setup file **402**.

Inserts for each batch of mail are defined by a job setup. For example, a record in the mail run datafile **220** may call for insert **1**, which may be targeted marketing material for ski vacations in Vermont. In the physical inserter **106** a stack of brochures about ski resorts in Vermont may be loaded for insertion. In the case of the electronic inserter **110**, for a particular batch of mail, the insert needs to be developed in a format appropriate for each delivery mechanism.

Accordingly, the job setup for this batch of mail, e.g. job setup file **402**, contains a set of templates and inserts for each delivery mechanism. The job setup for the web server delivery mechanism may specify the URL of a home page for a Vermont ski resort. If the delivery mechanism is electronic mail, the corresponding insert may specify a text memo to be attached to an electronic mail message. It is possible for a job setup to specify no appropriate insert for a specific delivery mechanism, e.g. fax. It is noted that templates may specify logos and standard information to be included in each document. Job setups may also specify "hot-links," which are inserts with no corresponding physical counterparts, for example, a corporate logo on a corporate web page.

Job setups can also specify a generic notification message for each delivery mechanism available for notification. For example, a fax may be sent to a recipient, informing the recipient that a web page includes his latest statement, for example a monthly billing statement. Generic notification messages are not personalized, and so can be predefined for an entire job or batch of mail pieces.

Referring to FIG. **5**, job setups may be defined by a job setup process **520** (not shown in FIG. **1**). The job setup process is an interactive application that allows a user to select templates and inserts for each delivery mechanism from a library. For example, electronic mail library **500** includes templates for formatting electronic mail messages. Fax library **502** may include templates and inserts as text files and text attachments to be sent along with a fax. Web library **504** includes the inserts in the form of URLs (web page addresses), PDF (Postscript Display Format, a portable display standard), or HTML (Hyper-Text Markup Language) files, which are common on the World Wide Web. Thus, the job setup process **520** prompts the user for templates, HTML files, text attachments, e.g. through a dialog box or a form for each electronic delivery mechanism. The job setup process **520** records and enables editing of the user's selections of templates and inserts for each electronic delivery mechanism. The output of the job setup process **520** is a job setup file, e.g. job setup file **402** and job setup file **518**.

Referring back to FIG. **4**, electronic inserter **110** applies job setup file **402** to a batch of mail pieces in the electronic delivery printstream **224** for producing electronic mail pieces **404**, **406**, and **408** with the appropriate insert instructions, e.g. insert instructions **414**. The electronic inserter **110** also reads out corresponding records from electronic mail run datafile **222** for generating the application electronic delivery information **412** in each electronic mail piece. Furthermore, the electronic inserter **110** stores status information about each electronic mail piece in interlock file **400**. Each electronic mail piece is placed on a server executing message router **112**, which may be a separate server from the mail server upon which the electronic inserter **110** is executed.

Message Routing

The message router **112** detects that a new electronic mail piece has been received from the electronic inserter **110**. The message router **112** decodes the delivery preference data **322**

and **324**, which was derived from the corresponding record in electronic mail run datafile **222** and appended to the electronic mail piece as electronic mail delivery instructions **412** by electronic inserter **110**. Message router **112** sends the electronic mail piece to an output server subsystem **113** (shown in FIG. **1**) for actual delivery. For example, if web server **116** is specified by the first delivery preference **322**, the output server subsystem **113** sends the electronic mail piece to web server **116**. The system may be configured to wait for a preset amount of time, e.g. four days, for the recipient to access the web page where the electronic mail piece was delivered. If the recipient has not accessed the web page in the preset amount of time, the electronic mail piece is considered not be delivered. For other delivery mechanisms, the delivery failure may be detected more directly, e.g., in the case of a busy signal for a fax number.

If the electronic mail piece is not delivered according to the delivery mechanism specified in the first delivery preference **322**, the corresponding document is processed according to the second delivery preference **324** until all the delivery preferences have been exhausted. Status for each electronic mail piece is reported to status/regeneration processor **118** and stored in the interlock file **400**. It is important for the message router **112** to be provided with a complete electronic delivery package, that is an electronic mail piece with insert instructions **414** for each electronic delivery mechanism, because the electronic mail piece may be in process for many days after the electronic inserter **110** has processed the entire batch. For example, the message router **112** may have to wait days for the Web server **116** to be accessed before utilizing the second delivery option.

The message router **112** communicates with the electronic inserter **110** through message files. For example, a separate downloaded configuration file (not shown) may specify whether to stop processing or ignore when an attachment file is missing. There is also communication for indicating that error conditions have been fixed and that the message router **112** should restart processing if stopped.

Status/Regeneration Processor

The interlock file **400** is used for checking document status and determining which electronic mail pieces need to be regenerated if all the electronic delivery mechanisms have proved unsuccessful. In particular, the status/regeneration processor **118**, which may be a program executing on mail server **600** in FIG. **6**, scans the interlock file **400** for documents whose status indicates that regeneration is necessary. For physical mail pieces this may occur because the physical inserter **106** generated a bad insert, e.g. an insert jammed. For electronic mail pieces, regeneration maybe necessary for those electronic mail pieces that have not been successfully delivered.

Accordingly, the regeneration processor **118** outputs a "regen" file **602** containing the piece identifiers **300** of the documents that need to be regenerated, printed by printer **104**, and processed by physical inserter **106**.

While the present invention has been described in connection with what is presently considered to be the most practical and preferred embodiments, it is to be understood that the invention is not limited to the disclosed embodiment, but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

What is claimed is:

1. A system for generating mail pieces for delivery to recipients in one of printed or electronic form comprising:

a printstream processor to receive a printstream, said printstream including mail piece data corresponding to a plurality of mail pieces, each one of said plurality of mail pieces intended for a respective recipient, said printstream processor separating said printstream into at least one of a physical delivery printstream and an electronic delivery printstream based on a respective preference prescribed by each respective recipient;

a printer coupled to the printstream processor for printing the physical delivery printstream to create a plurality of printed documents, each of said printed documents corresponding to a respective one of said plurality of mail pieces that is to be delivered in a printed form;

an inserter system coupled to the printer for generating mail pieces in printed form, wherein each mail piece in printed form includes one of the plurality of printed documents and wherein at least one of the mail pieces in printed form include respective printed inserts;

an electronic inserter coupled to the printstream processor for separating the electronic delivery printstream into a plurality of electronic documents, each of said electronic documents corresponding to a respective one of said plurality of mail pieces that is to be delivered in electronic form, and for generating mail pieces in electronic form, wherein each mail piece in electronic form includes one of the plurality of electronic documents and wherein at least one of the mail pieces in electronic form includes respective electronic inserts; and

a message router coupled to the electronic inserter for delivering the mail pieces in electronic form.

2. The system of claim **1**, further comprising a regeneration processor for receiving piece status information, said regeneration processor causing a mail piece corresponding to a mail piece in electronic form to be generated in printed form if the piece status information of the mail piece in electronic form indicates that the electronic mail piece has not been received by an intended recipient within a predetermined period of time.

3. The system of claim **1**, wherein the message router is configured to deliver at least one of the mail pieces in electronic form to a World Wide Web server and wherein the electronic insert corresponding to the at least one of the mail pieces in electronic form is a link to a page on the World Wide Web.

4. The system of claim **1**, wherein the message router is configured to deliver at least one of the mail pieces in electronic form via electronic mail.

5. The system of claim **1**, wherein the message router is configured to deliver at least one of the mail pieces in electronic form to a facsimile machine.

6. The system of claim **1**, wherein the message router is configured to selectively deliver the mail pieces in electronic form by one of a plurality of delivery mechanisms based on recipient preference.

7. The system of claim **6**, wherein the message router is configured to send a notification message by another of the plurality of delivery mechanisms confirming delivery of the mail pieces in electronic form.

8. A method for generating mail pieces for delivery to recipients in one of printed or electronic form comprising:

receiving a printstream, said printstream including mail piece data corresponding to a plurality of mail pieces, each one of said plurality of mail pieces intended for a respective recipient;

separating said printstream into at least one of a physical delivery printstream and an electronic delivery print-

stream based on a respective preference prescribed by each respective recipient;

printing the physical delivery printstream to create a plurality of printed documents, each of said printed documents corresponding to a respective one of said plurality of mail pieces that is to be delivered in a printed form;

generating mail pieces in printed form, wherein each mail piece in printed form includes one of the plurality of printed documents and wherein at least one of the mail pieces in printed form include respective printed inserts;

separating the electronic delivery printstream into a plurality of electronic documents, each of said electronic documents corresponding to a respective one of said plurality of mail pieces that is to be delivered in electronic form;

generating mail pieces in electronic form, wherein each mail piece in electronic form includes one of the plurality of electronic documents and wherein at least one of the mail pieces in electronic form includes respective electronic inserts; and

delivering the mail pieces in electronic form.

9. The method of claim **6**, further comprising:

receiving piece status information about one of said mail pieces in electronic form; and

generating in printed form a mail piece corresponding to a mail piece in electronic if the piece status information of the mail piece in electronic form indicates that the electronic mail piece has not been received by an intended recipient within a predetermined period of time.

10. The method of claim **8**, wherein:

the step of delivering the mail pieces in electronic form includes delivering at least one of the mail pieces in electronic form to a World Wide Web server, and

the step of generating the mail pieces in electronic form includes inserting a link to a page on the World Wide Web.

11. The method of claim **8**, wherein the step of delivering includes delivering at least one of the mail pieces in electronic form via electronic mail.

12. The method of claim **8**, wherein the step of delivering includes delivering at least one of the mail pieces in electronic form to a facsimile machine.

13. The method of claim **8**, wherein the step of delivering includes selectively delivering the mail pieces in electronic form by one of a plurality of delivery mechanisms based on recipient preference.

14. The method of claim **13**, further comprising:

sending a notification message by another of the plurality of delivery mechanisms confirming delivery of the mail pieces in electronic form.

15. A method for generating mail pieces as recited in claim **8**, further comprising the steps of:

providing a plurality of instruction templates, wherein each template identifies a format corresponding to one of a plurality of electronic delivery mechanisms;

associating each mail piece in electronic form with at least one of the plurality of instruction templates; and

wherein the step of delivering the mail pieces in electronic form further comprises delivering the mail pieces in electronic form by one of the plurality of electronic delivery mechanisms associated with the at least one of the plurality of instruction templates.

16. A method for generating mail pieces as recited in claim **15** further including the steps of:

associating at least one mail piece in electronic form with at least first and second templates, wherein the first template provides a first choice electronic delivery mechanism and the second template provides a second choice delivery mechanism.

17. A method for generating mail pieces as recited in claim **16** further including the steps of:

determining if the at least one mail piece in electronic form was delivered by the first choice electronic delivery mechanism; and

delivering the at least one mail piece in electronic form by the second choice delivery mechanism if the at least one mail piece in electronic form was determined not to be delivered by the first choice delivery mechanism.

18. A method for generating mail pieces as recited in claim **17**, further including the step of:

waiting a predefined amount of time before performing the determining step.

19. A method for generating mail pieces as recited in claim **15** further including the step of:

notifying a recipient, by a method other than the electronic mechanism used to deliver the mail piece, that a mail piece in electronic form has been delivered by an electronic delivery mechanism.

20. A method for generating mail pieces as recited in claim **19** wherein the step of notifying a recipient includes the step of notifying a recipient with a facsimile message indicating that the mail piece in electronic form has been delivered.

21. A method for generating mail pieces as recited in claim **16** wherein the delivery mechanism is selected to deliver the mail piece in electronic form in accordance with one of the following delivery methods: an e-mail message; a pager message; a facsimile message or a site on the world wide web.

22. A method for generating mail pieces as recited in claim **15** further including the steps of:

providing insert instructions with each electronic mail piece indicating what electronic inserts are to be associated with the electronic mail piece; and

wherein the step of delivering mail pieces in electronic form further includes delivering electronic inserts in accordance with the insert instructions.

23. A method for generating mail pieces as recited in claim **15** further including the step of:

encrypting the mail piece in electronic form before delivering it to a recipient.

24. A system for generating mail pieces as recited in claim **1** further comprising:

a database having a plurality of instruction templates, wherein each template corresponds to one of a plurality of electronic delivery mechanisms;

a computer processor for associating each electronic mail piece with at least one instruction template; and

wherein the message router delivers the electronic mail pieces and respective electronic insert mail pieces by one of the plurality of electronic delivery mechanisms in accordance with the at least one instruction template.

25. A system for generating mail pieces as recited in claim **24**, wherein the message router is configured to deliver at least one of the electronic mail pieces to a World Wide Web server and the electronic insert is a link to a page on the World Wide Web.

26. A system for generating mail pieces as recited in claim 24, wherein the message router is configured to deliver at least one of the electronic mail pieces via electronic mail.

27. A system for generating mail pieces as recited in claim 24, wherein the message router is configured to deliver at least one of the electronic mail pieces to a pager.

28. A system for generating mail pieces as recited in claim 24, wherein the message router is configured to deliver at least one of the electronic mail pieces to a facsimile machine and the electronic insert is a document.

29. A system for generating mail pieces as recited in claim 24, wherein the message router is configured to selectively deliver the electronic mailpieces to a web server, an electronic mail address, a facsimile machine, and a printer.

30. A system for generating mail pieces as recited in claim 24, wherein the message router is configured to send a notification message by one of the plurality of delivery mechanisms.

* * * * *

US005777883A

United States Patent [19]

Lau et al.

[11] Patent Number: 5,777,883

[45] Date of Patent: Jul. 7, 1998

[54] **SYSTEM AND METHOD FOR MAIL RUN PROCESSING ON MULTIPLE INSERTERS**

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[73] Assignee: **Pitney Bowes Inc.**, Stamford, Conn.

[21] Appl. No.: **637,881**

[22] Filed: **Apr. 25, 1996**

[51] **Int. Cl.**[6] **G06F 17/00**

[52] **U.S. Cl.** **364/478.08**; 364/478.1; 364/478.11; 364/478.09

[58] **Field of Search** 364/478.01, 478.07, 364/478.08, 478.09, 478.1, 478.11, 478.12, 478.13, 478.14, 478.15, 464.02, 464.03, 464.04; 53/493–495, 498–500

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Primary Examiner—Reba I. Elmore
Assistant Examiner—Thomas E. Brown
Attorney, Agent, or Firm—Charles R. Malandra, Jr.; Melvin J. Scolnick

[57] **ABSTRACT**

A method of processing a mail run on a plurality of inserter systems, including first and second inserter systems, comprising the following steps. A mail run data file (MRDF) is downloaded to a file server. Documents comprising mailpieces of the mail run are scanned at each of the plurality of inserter systems. Each of the documents are scanned for an MRDF ID and a mailpiece ID. A MRDF data block is requested from the file server by each of the inserter systems based on the MRDF ID and mailpiece ID scanned at each of the plurality of inserter systems. The file server verifies that the respective request from each of the inserter systems has data available for the requested mailpiece ID and that the requested mailpiece ID has not been processed by any of the plurality of inserter systems. The file server allocates the requested MRDF data block respectively to each of the inserter systems when the data is available and the requested mailpiece has not been processed. Each inserter system uses mailpiece data from the respective MRDF data block to create a mailpiece at each of the plurality of inserter systems. The file server denies allocation of the MRDF data block requested by a first inserter system when the data is not available or when the requested MRDF data block has already been processed by a second inserter system.

11 Claims, 10 Drawing Sheets

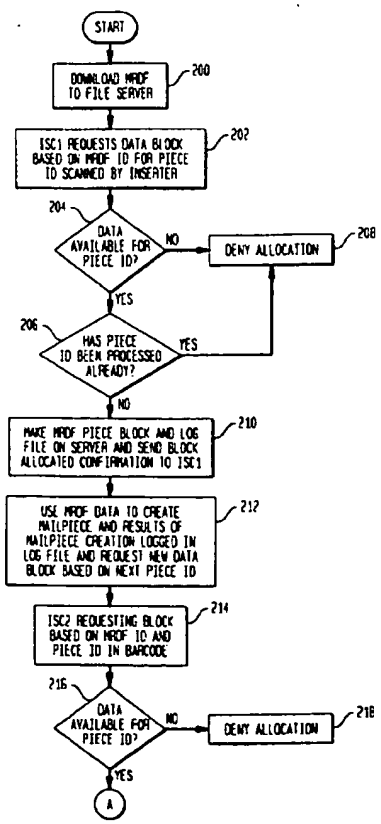


FIG. 1
(PRIOR ART)

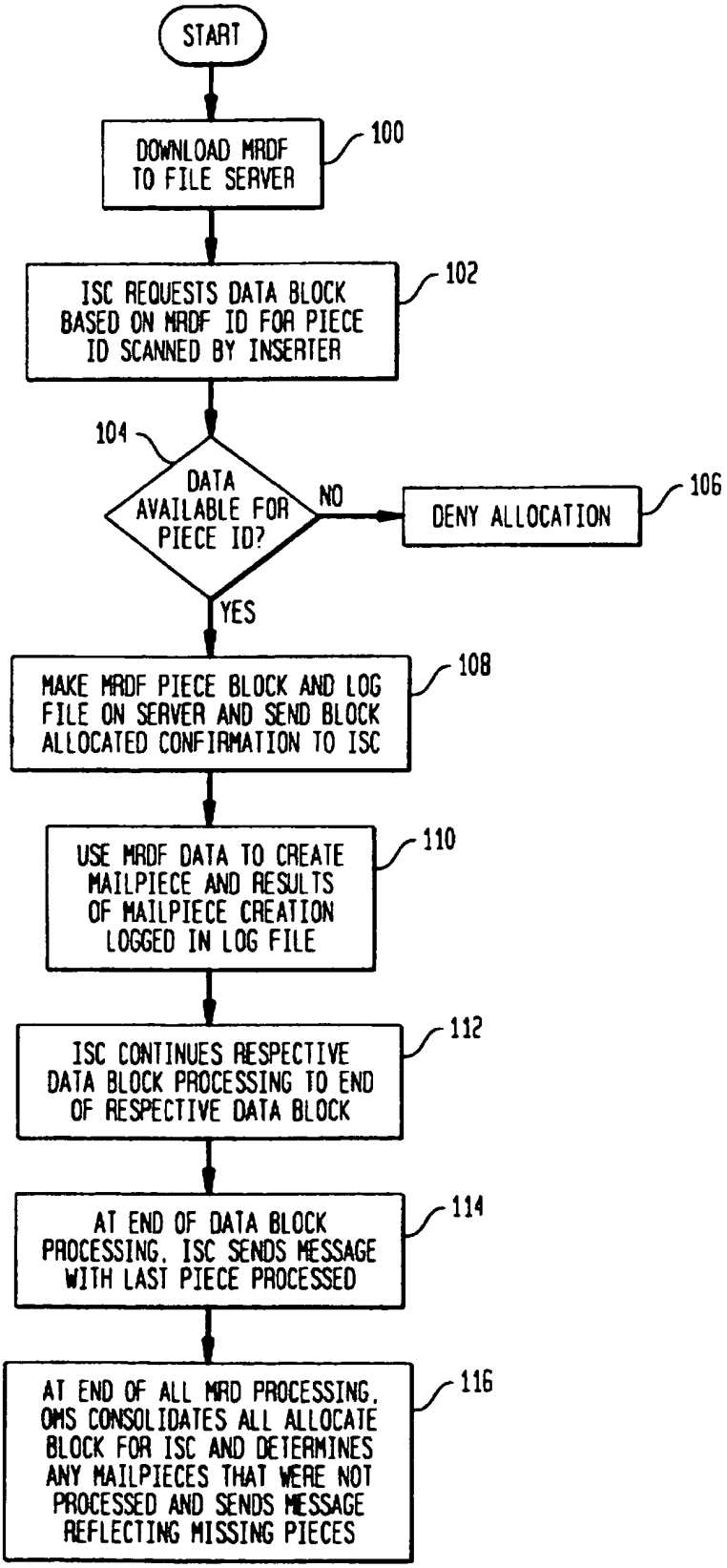


FIG. 2A

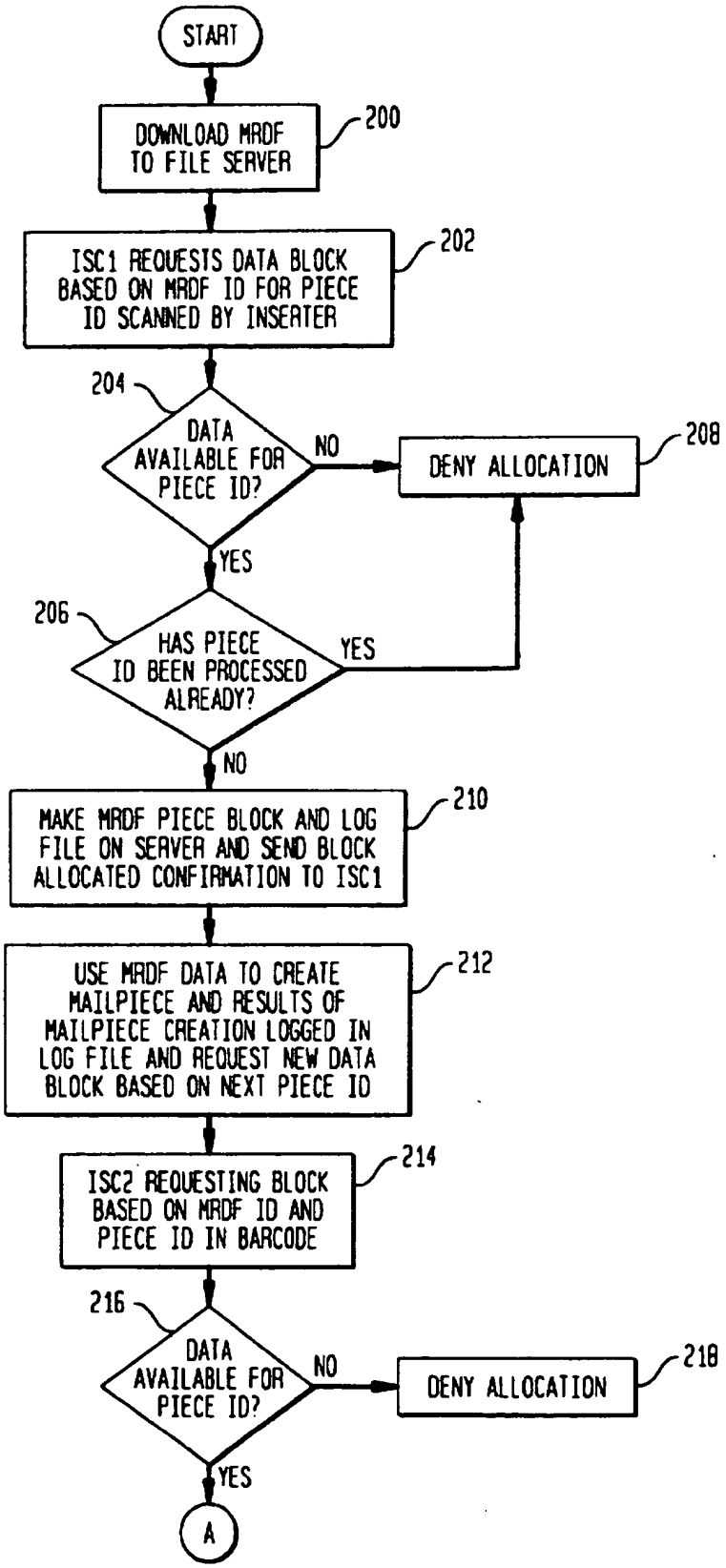

START
DOWNLOAD MRDF TO FILE SERVER
200
ISC1 REQUESTS DATA BLOCK BASED ON MRDF ID FOR PIECE ID SCANNED BY INSERTER
202
204
DATA AVAILABLE FOR PIECE ID?
NO
DENY ALLOCATION
208
YES
206
HAS PIECE ID BEEN PROCESSED ALREADY?
YES
NO
MAKE MRDF PIECE BLOCK AND LOG FILE ON SERVER AND SEND BLOCK ALLOCATED CONFIRMATION TO ISC1
210
USE MRDF DATA TO CREATE MAILPIECE AND RESULTS OF MAILPIECE CREATION LOGGED IN LOG FILE AND REQUEST NEW DATA BLOCK BASED ON NEXT PIECE ID
212
ISC2 REQUESTING BLOCK BASED ON MRDF ID AND PIECE ID IN BARCODE
214
216
DATA AVAILABLE FOR PIECE ID?
NO
DENY ALLOCATION
218
YES
A

FIG. 2B

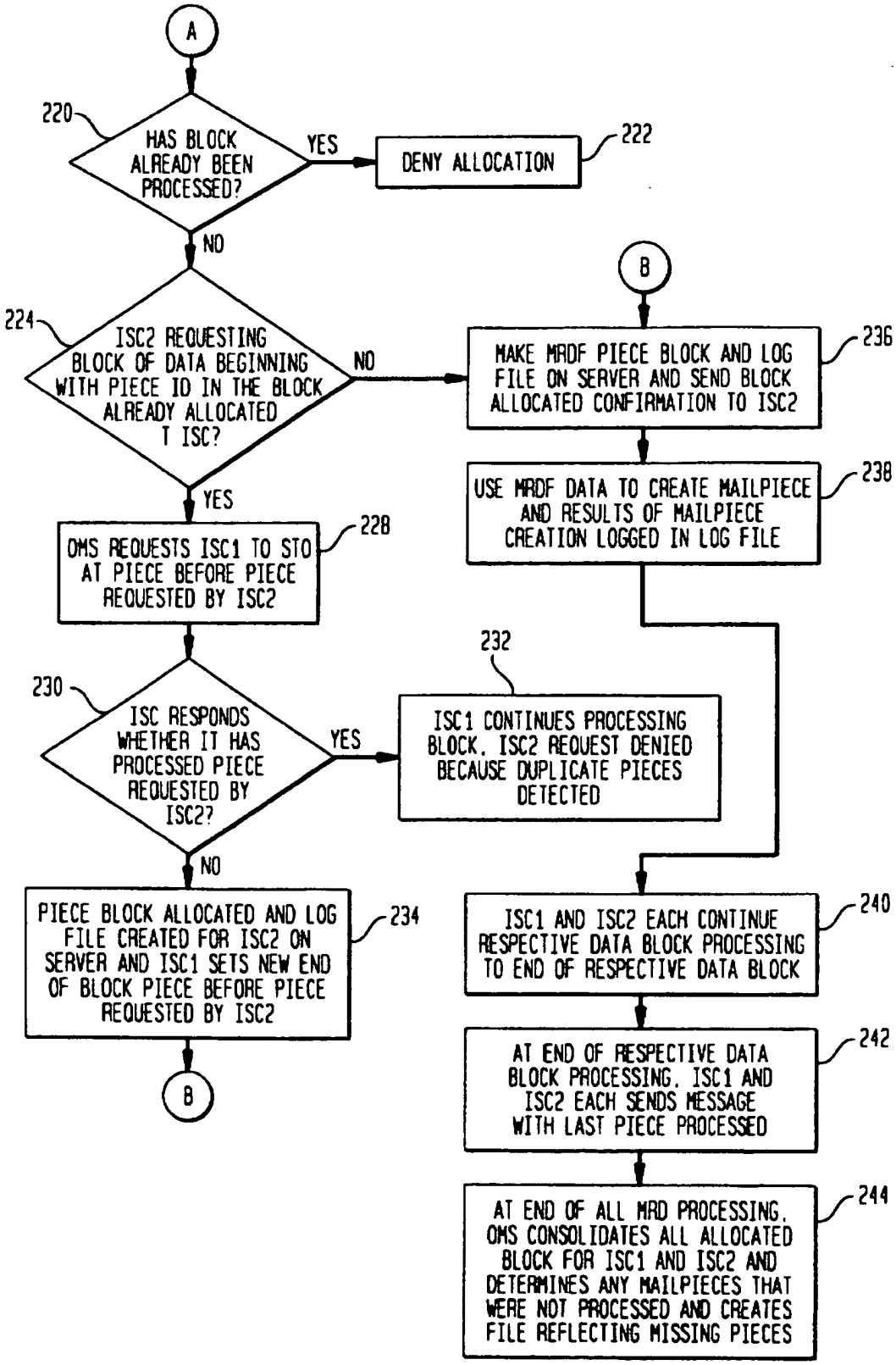

A
220
HAS BLOCK ALREADY BEEN PROCESSED?
YES
222
DENY ALLOCATION
NO
B
224
ISC2 REQUESTING BLOCK OF DATA BEGINNING WITH PIECE ID IN THE BLOCK ALREADY ALLOCATED T ISC?
NO
236
MAKE MRDF PIECE BLOCK AND LOG FILE ON SERVER AND SEND BLOCK ALLOCATED CONFIRMATION TO ISC2
238
USE MRDF DATA TO CREATE MAILPIECE AND RESULTS OF MAILPIECE CREATION LOGGED IN LOG FILE
YES
228
OMS REQUESTS ISC1 TO STO AT PIECE BEFORE PIECE REQUESTED BY ISC2
232
230
ISC RESPONDS WHETHER IT HAS PROCESSED PIECE REQUESTED BY ISC2?
YES
ISC1 CONTINUES PROCESSING BLOCK. ISC2 REQUEST DENIED BECAUSE DUPLICATE PIECES DETECTED
NO
234
PIECE BLOCK ALLOCATED AND LOG FILE CREATED FOR ISC2 ON SERVER AND ISC1 SETS NEW END OF BLOCK PIECE BEFORE PIECE REQUESTED BY ISC2
240
ISC1 AND ISC2 EACH CONTINUE RESPECTIVE DATA BLOCK PROCESSING TO END OF RESPECTIVE DATA BLOCK
242
AT END OF RESPECTIVE DATA BLOCK PROCESSING, ISC1 AND ISC2 EACH SENDS MESSAGE WITH LAST PIECE PROCESSED
244
AT END OF ALL MRD PROCESSING, OMS CONSOLIDATES ALL ALLOCATED BLOCK FOR ISC1 AND ISC2 AND DETERMINES ANY MAILPIECES THAT WERE NOT PROCESSED AND CREATES FILE REFLECTING MISSING PIECES
B

FIG. 3

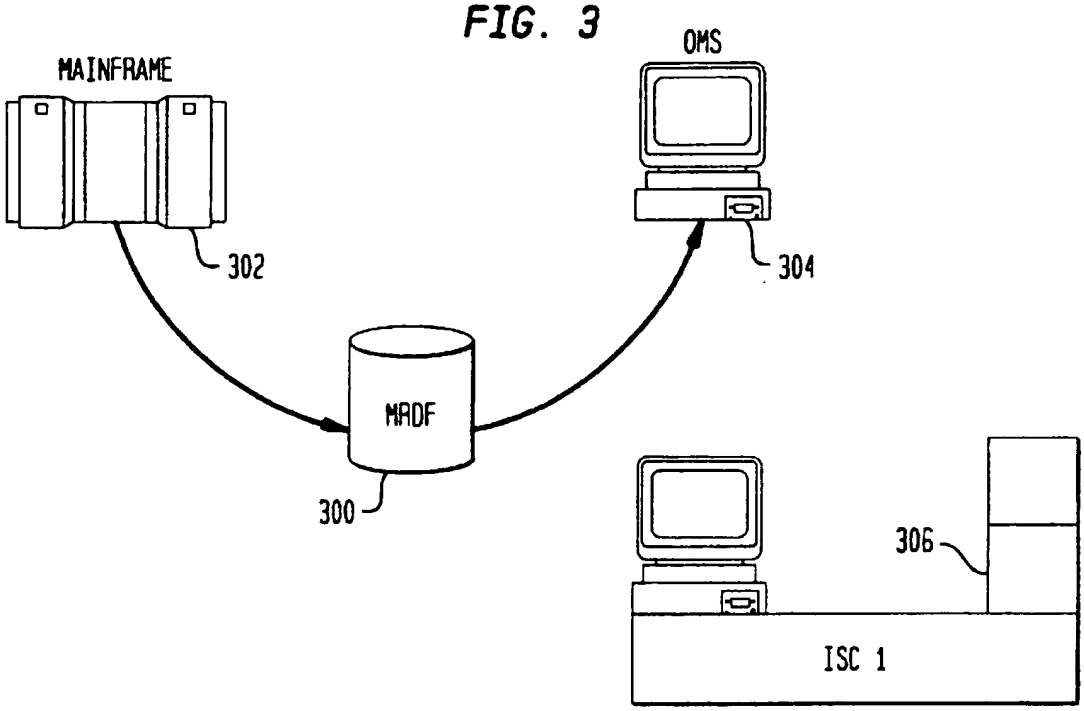

MAINFRAME
OMS
302
304
MRDF
300
306
ISC 1

FIG. 4

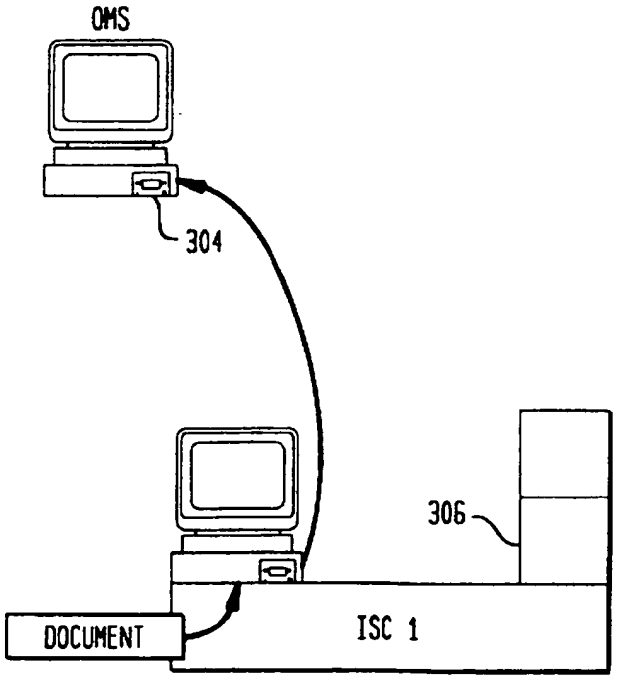

OMS
304
306
DOCUMENT
ISC 1

FIG. 5

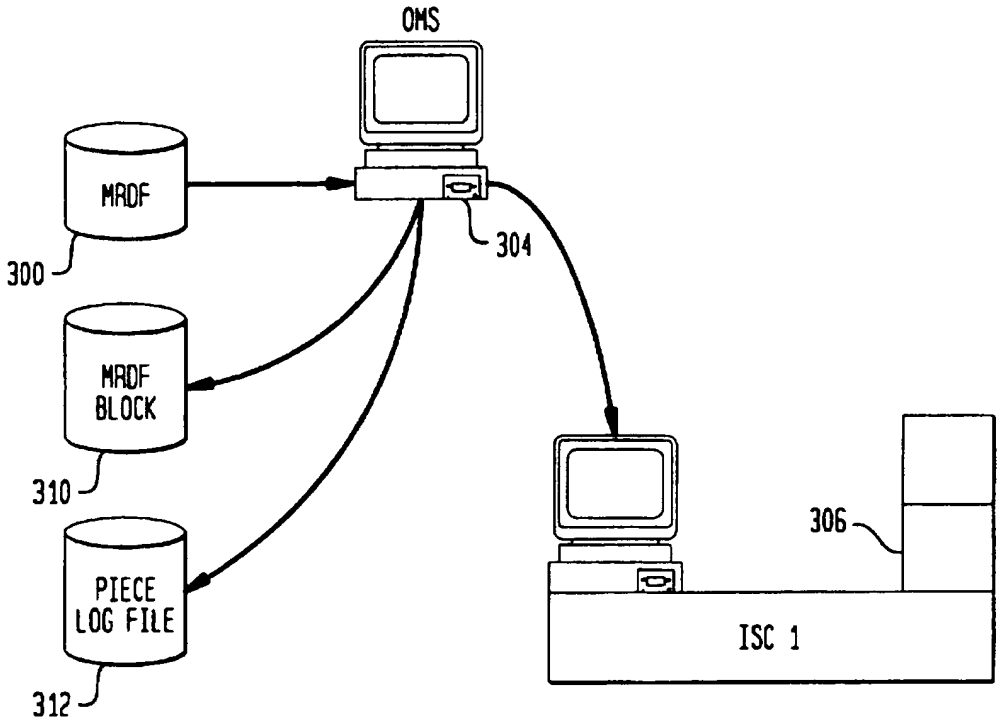

OMS
MRDF
300
MRDF BLOCK
310
PIECE LOG FILE
312
304
306
ISC 1

FIG. 6

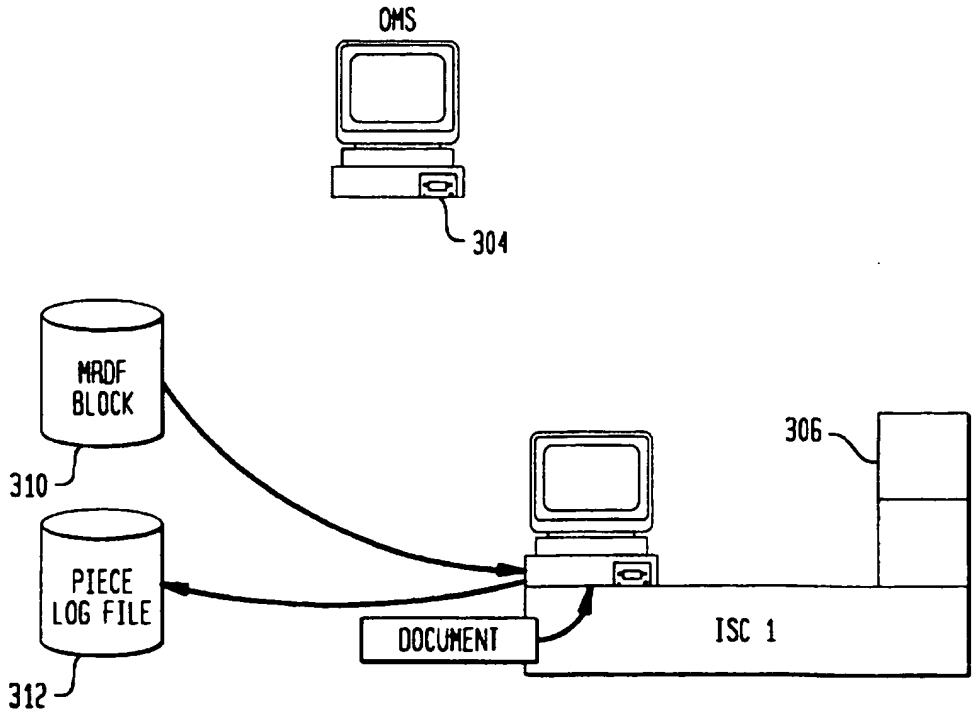

OMS
304
MRDF BLOCK
310
PIECE LOG FILE
312
DOCUMENT
306
ISC 1

FIG. 7

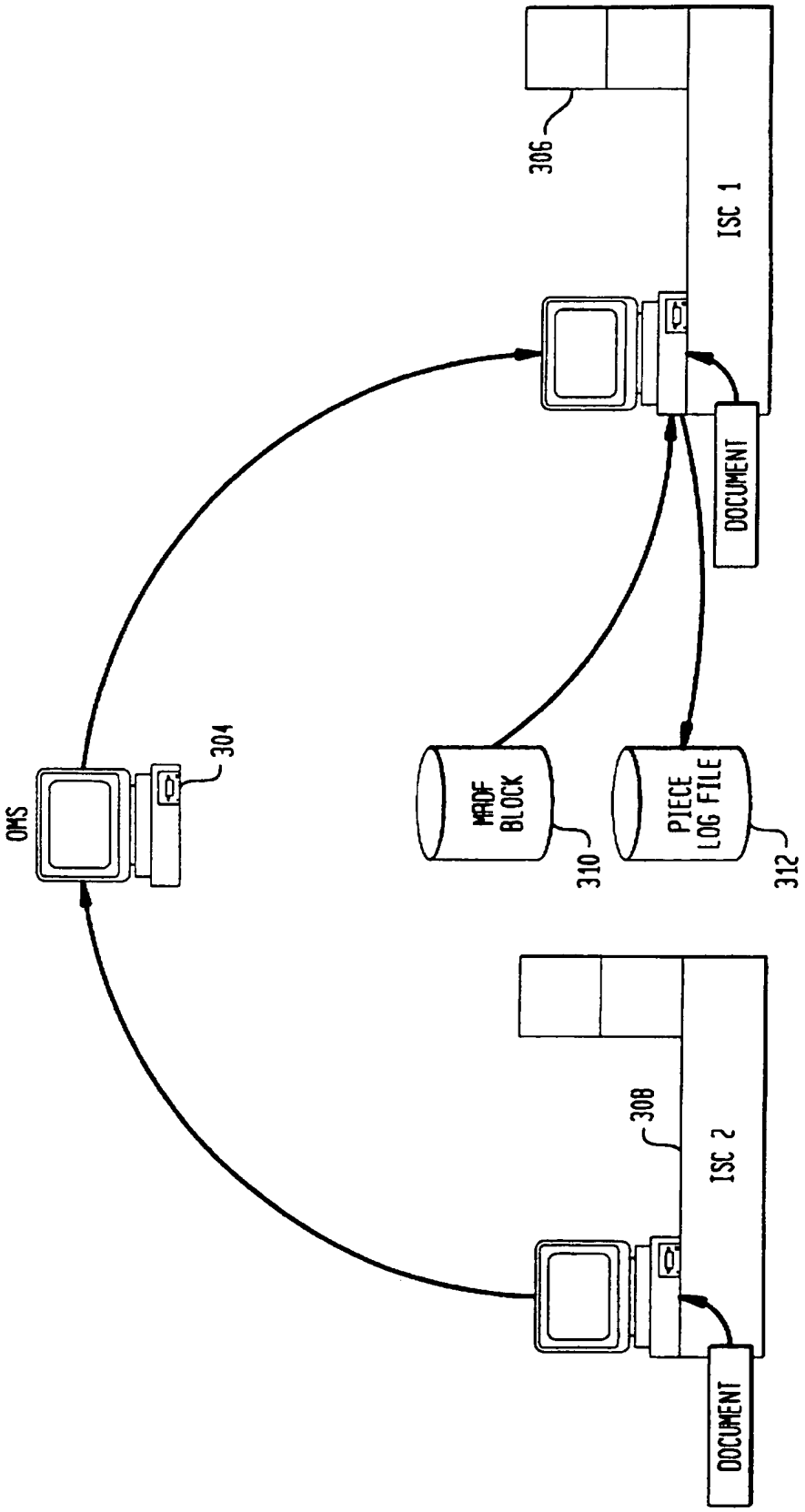

306
ISC 1
DOCUMENT
OMS
304
MROF BLOCK
310
PIECE LOG FILE
312
308
ISC 2
DOCUMENT

FIG. 8

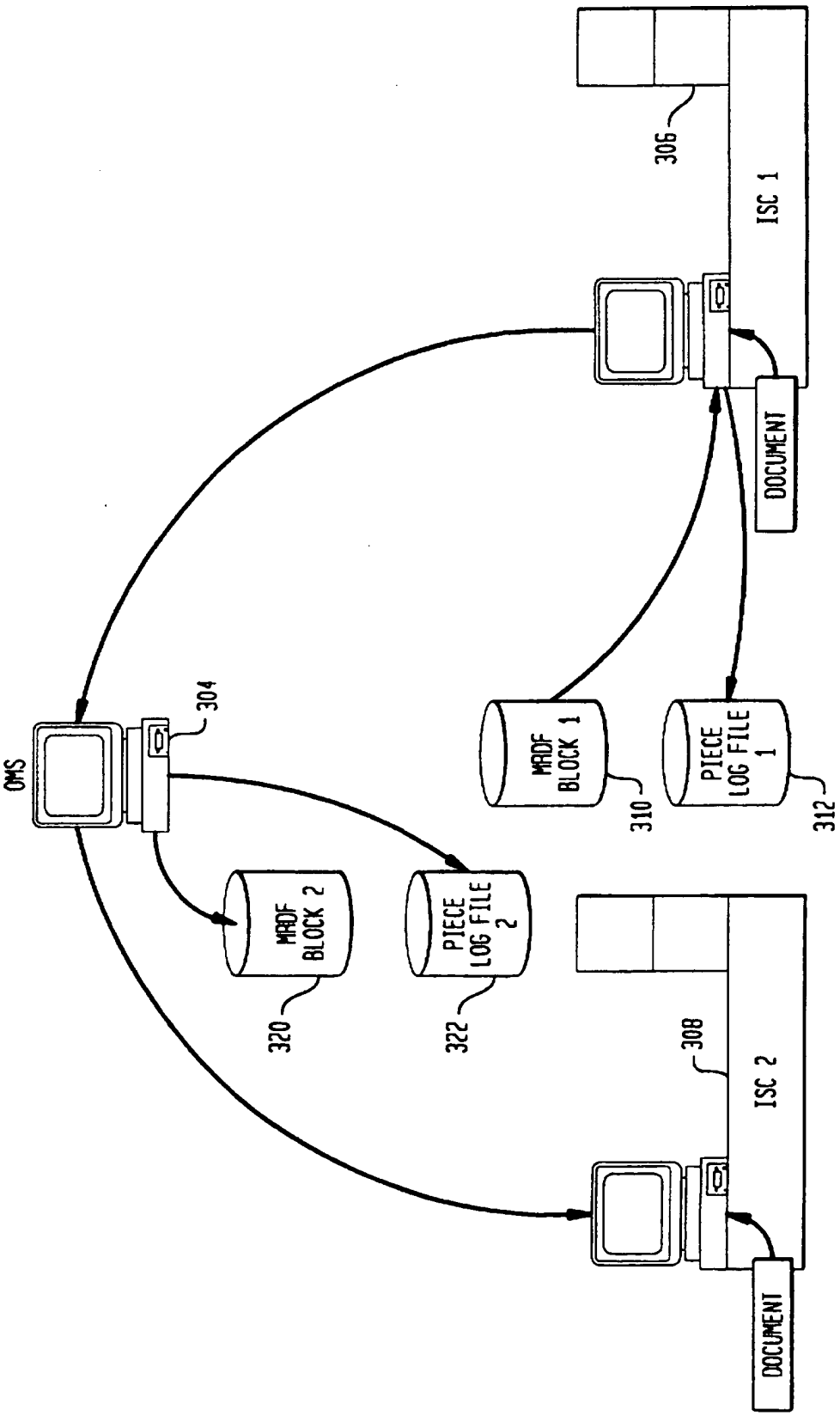

OMS
304
MADF BLOCK 2
320
PIECE LOG FILE 2
322
ISC 2
308
DOCUMENT
MADF BLOCK 1
310
PIECE LOG FILE 1
312
ISC 1
306
DOCUMENT

FIG. 9

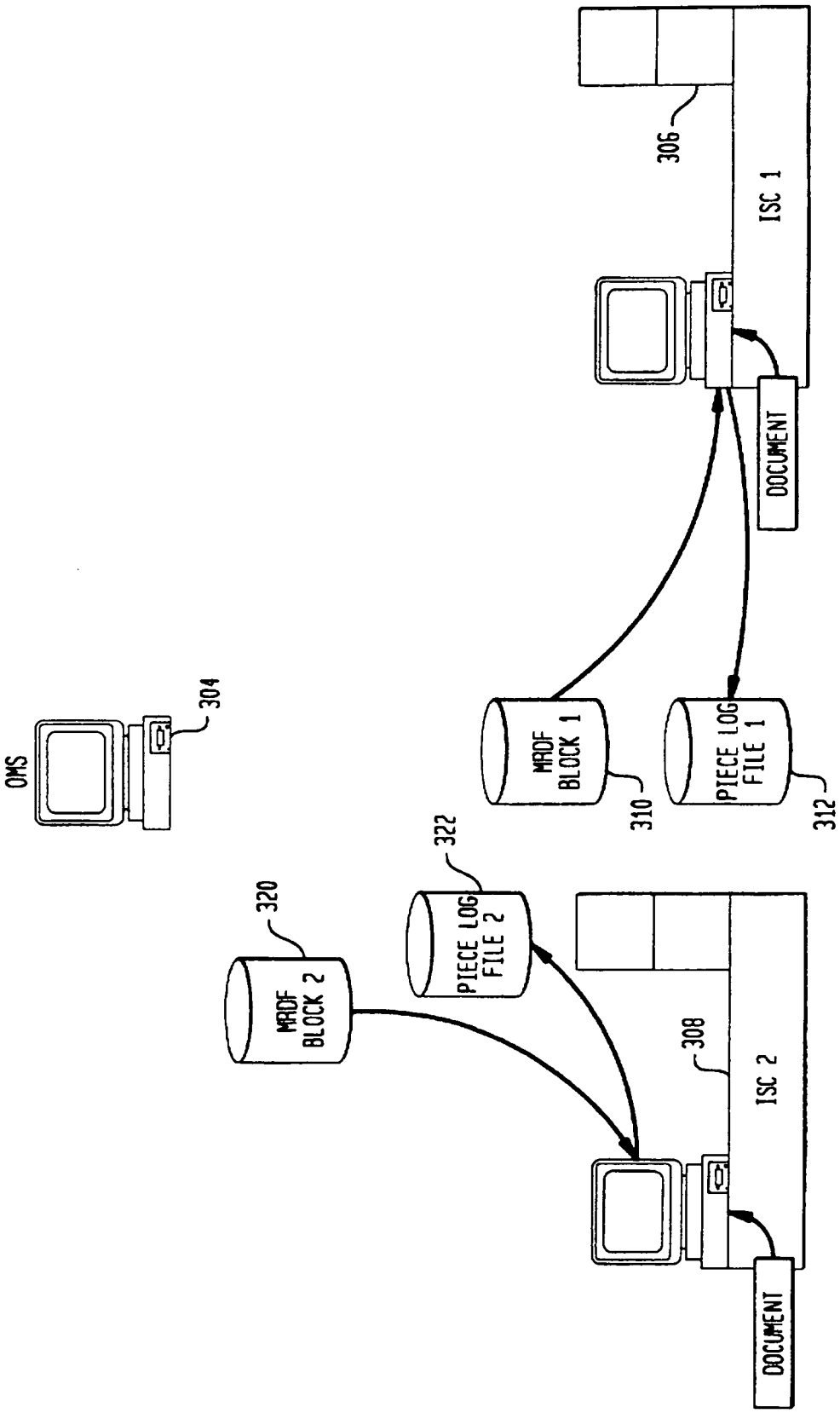

OMS
304
306
ISC 1
DOCUMENT
MRDF BLOCK 1
310
PIECE LOG FILE 1
312
322
320
PIECE LOG FILE 2
MRDF BLOCK 2
308
ISC 2
DOCUMENT

FIG. 10

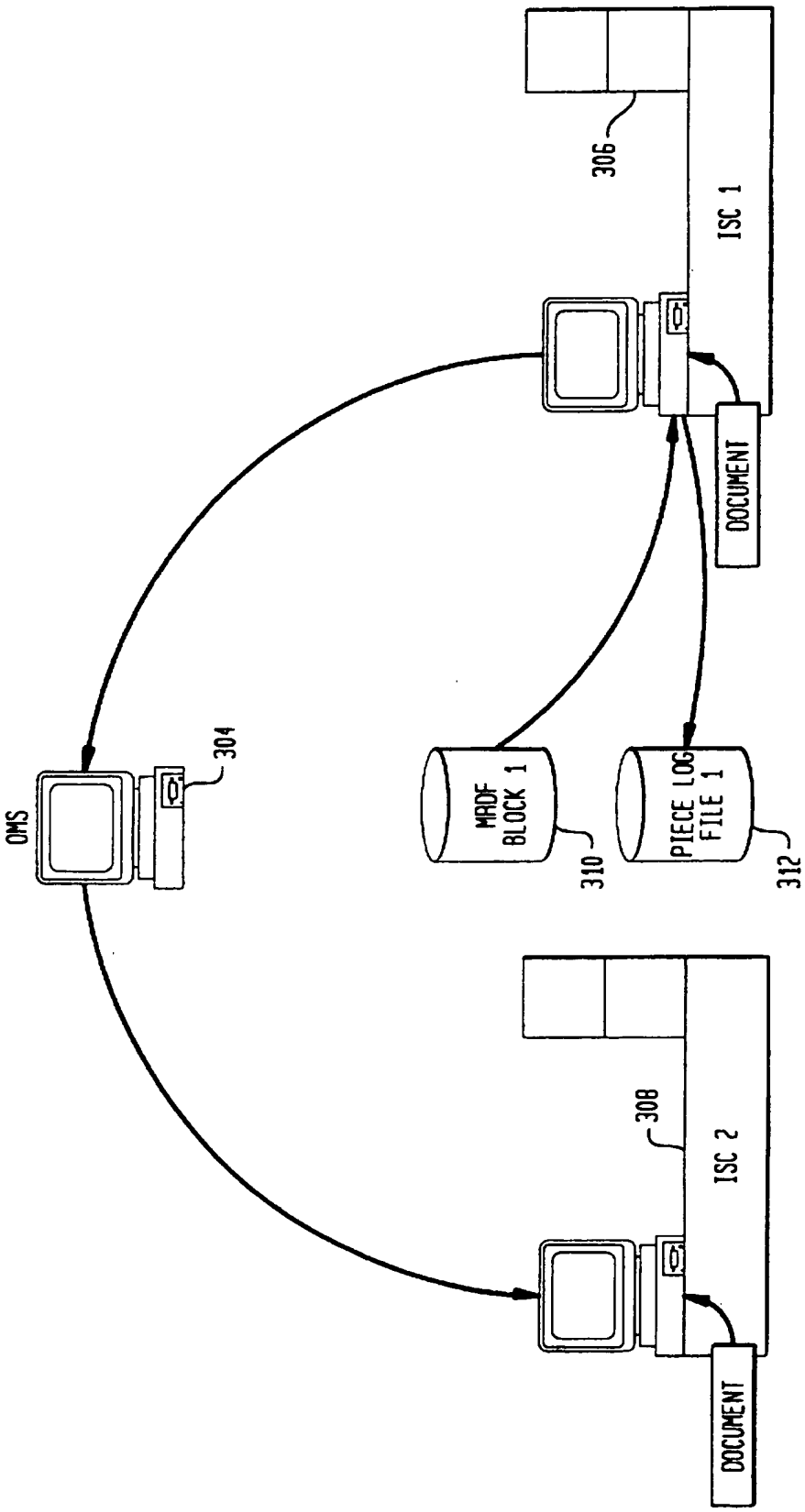
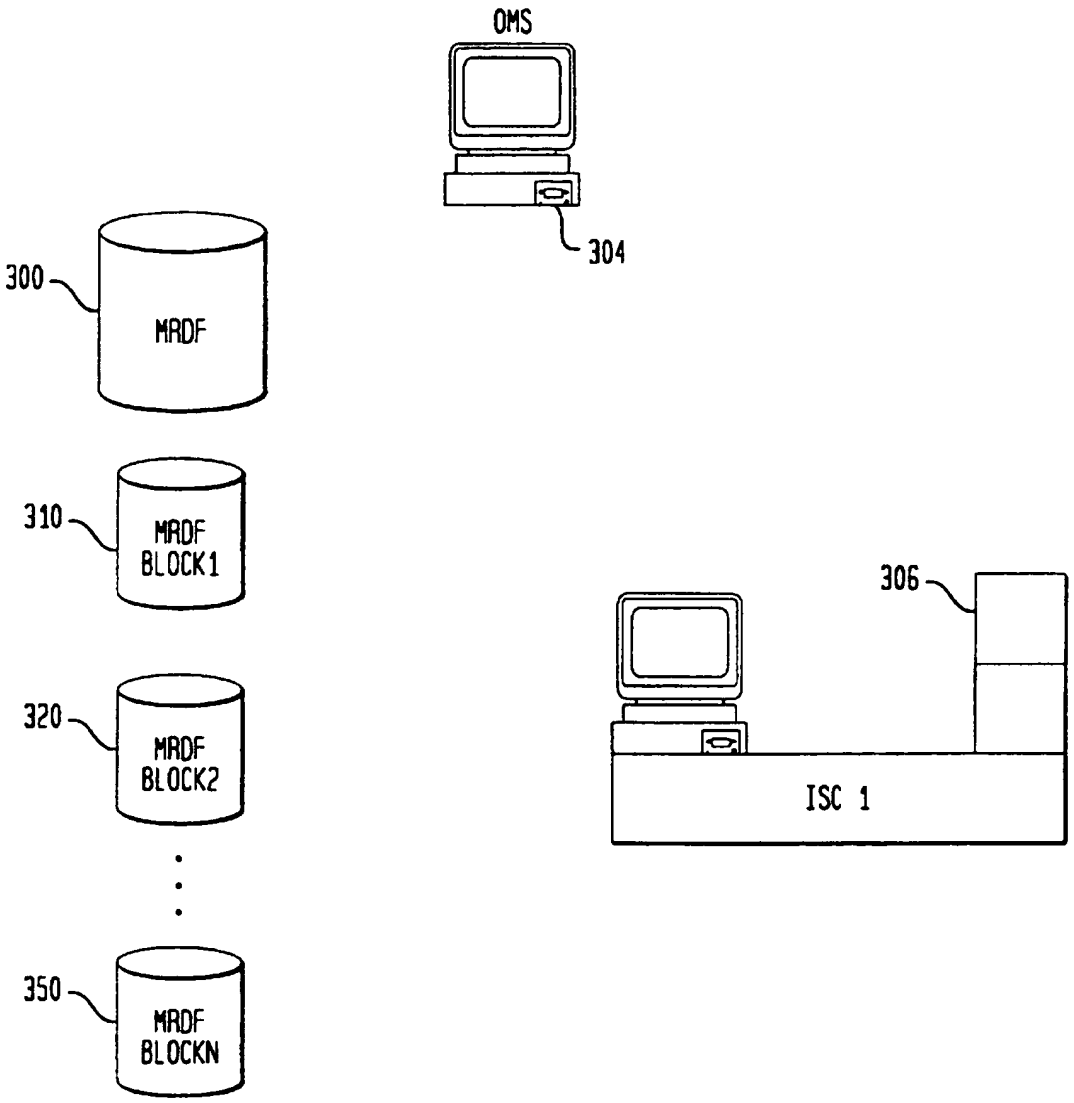

306
ISC 1
DOCUMENT
OMS
304
MRDF BLOCK 1
310
PIECE LOG FILE 1
312
308
ISC 2
DOCUMENT

FIG. 11


OMS
304
300
MRDF
310
MRDF
BLOCK1
320
MRDF
BLOCK2
350
MRDF
BLOCKN
306
ISC 1

SYSTEM AND METHOD FOR MAIL RUN PROCESSING ON MULTIPLE INSERTERS

FIELD OF THE INVENTION

The present invention relates generally to system and method for processing a mail run on inserter systems and, more particularly, to such system and method for processing a mail run on multiple inserter systems.

BACKGROUND OF THE INVENTION

The use of inserter systems, such as the Series 9 Inserter Systems manufactured by Pitney Bowes Inc. of Stamford Conn., is well known. Such inserter systems are used by certain organizations for assembling large amounts mailpieces for dispatch through the postal system. Examples of such organizations are: banking institutions, utility companies, insurance companies, credit companies, and the like. Typically, such organizations create documents, such as billing documents, in a mainframe computer system that is separate from the inserter system that will process the documents into such mailpieces. Each batch of documents is generally referred to as a "mail run".

Generally, inserter systems have processed mail runs based on control codes printed on the documents being processed. Early versions of the inserter systems recognized limited control information, such as first document of a mailpiece and number of documents in a mailpiece. Later versions evolved into more sophisticated control applications, such as prioritized selections of optional inserts.

Most recently, inserter system technology has evolved to include the processing of a mail run based on an electronic data file, referred to herein as a mail run data file ("MRDF") that is generated off line from the inserter system, for example, by the mainframe computer, which created the mail run documents. The MRDF is a file containing individual mailpiece records for all the mailpieces in a mail run. Since the inserter system performs document tracking for each of the mailpieces based on the mailpiece record in the MRDF, the inserter system can verify the mail run integrity against the MRDF. Thus, the inserter system can detect duplicate mailpieces, missing mailpieces and can provide a summary of such detections.

Generally, high volume mailers that process large mail runs on a continuous basis use several inserter systems in parallel to achieve a desired, high volume, mail run rate. Heretofore, the control of multiple inserter systems running a single mail run has been limited to controlling each inserter system separately from one another. Such control requires an inspection of some type to verify the integrity of the completed mail run. Thus, such high volume mailers have given up the mail run integrity associated with the MRDF processing on single inserter systems.

It is an object of the present invention to provide MRDF processing using the multiple inserter systems. It is a further object of the present invention to achieve the same level of mail run integrity for a mail run processed on multiple inserter systems as would be achieved if processed on a single inserter.

SUMMARY OF THE INVENTION

The present invention provides a system and method for achieving full mail run integrity during MRDF processing of a mail run that is processed in parallel on multiple inserter systems. It has been found that in accordance with the present invention, such parallel processing achieves the mail run rate desired by high volume mailers and also detects duplicate mailpieces, missing mailpieces and provides exception reporting through automatic MRDF processing across multiple inserters.

In accordance with the present invention, a system and method of processing a mail run on a plurality of inserter systems, including first and second inserter systems, comprising the following steps. A mail run data file (MRDF) is downloaded to a file server. Documents comprising mailpieces of the mail run are scanned at each of the plurality of inserter systems. Each of the documents are scanned for an MRDF ID and a mailpiece ID. A MRDF data block is requested from the file server by each of the inserter systems based on the MRDF ID and mailpiece ID scanned at each of the plurality of inserter systems. The file server verifies that the respective request from each of the inserter systems has data available for the requested mailpiece ID and that the requested mailpiece ID has not been processed by any of the plurality of inserter systems. The file server allocates the requested MRDF data block respectively to each of the inserter systems when the data is available and the requested mailpiece has not been processed. Each inserter system uses mailpiece data from the respective MRDF data block to create a mailpiece at each of the plurality of inserter systems. The file server denies allocation of the MRDF data block requested by a first inserter system when the data is not available or when the requested MRDF data block has already been processed by a second inserter system.

DESCRIPTION OF THE DRAWINGS

The above and other objects and advantages of the present invention will be apparent upon consideration of the following detailed description, taken in conjunction with accompanying drawings, in which like reference characters refer to like parts throughout, and in which:

FIG. 1 is a prior art flow chart for mail run data file processing on a single inserter system;

FIG. 2 (2A–2B) is a flow chart for mail run data file processing on multiple inserter systems in accordance with the present invention; and

FIGS. 3–11 are a schematic overview of the process described in FIG. 2, showing the mail run data processing for two inserter systems;

DETAILED DESCRIPTION OF THE PRESENT INVENTION

In describing the present invention, reference is made to the drawings, wherein there is seen FIG. 1 a flow chart of prior art mail run data file processing on a single inserter system. When a mail run is generated by the mainframe computer, a mail run data file ("MRDF") is created. The MRDF contains a record of information for every mailpiece in a mail run. For each mailpiece, the mainframe computer generates a barcode that contains a mail run data file identifier and a mailpiece ID corresponding to the mailpiece record in the MRDF.

At step **100**, the MRDF is downloaded to a file server, referred to herein as an office manager server ("OMS"), that communicates with the inserter system. When the inserter system begins processing a mail run, the inserter system scans the barcode of each document being processed and, at step **102**, the inserter system controller (ISC) requests a data block based on the MRDF ID and mailpiece ID scanned from the barcode. The data block is a subset of the MRDF.

The OMS responds to the request by either downloading to the inserter system, at step **108**, the data block corresponding to the MRDF ID and mailpiece ID, or denying allocation, at step **106**, because the MRDF ID or mailpiece ID is not correct, or because the mailpiece ID is a duplicate to one previously processed in the mail run. At step **110**, the ISC uses MRDF data to create the mailpiece on the inserter system and sends the results of the mailpiece creation to the OMS which logs such results in a log file. At step **112**, the ISC continues data block processing to the end of each respective block and requests the next block from the OMS at step **114**. For subsequent data block steps **102–112** are repeated. The inserter system processes the mailpieces through the end of the block of data, and automatically requests additional block of data until the last mailpiece in the mail run is processed. During mailpiece processing, the inserter system tracks and reports back to the OMS the damaged, duplicate or missing mailpieces within the data block. The inserter system notifies the OMS when the last mailpiece has been processed, at step **114**. At the end of mailpiece processing, the OMS verifies that all mailpieces were in fact processed and identifies all mailpieces not processed for the mail run, at step **116**.

Referring now to FIGS. **2A** and **2B** and FIGS. **3–11**, the mail run data file processing on multiple inserter systems in accordance with the present invention is shown. For ease of description, the present invention is described for two inserter systems. It will be understood by those skilled in the art that the present invention is suitable for more than two inserter systems processing the MRDF mail run in parallel.

At step **200**, the MRDF **300** is downloaded from a mailer's mainframe computer system **302**, which generates the documents of the mailpieces, to the OMS **304**. OMS **304** is preferably a separate processor that communicates with both the mainframe **302** and ISC1 of inserter system **306** and ISC2 of inserter system **308**. In an alternate embodiment (not shown), OMS **304** can be a separate processor resident in inserter system **306** or can be a separate application program/task in one of the ISCs, such as ISC1. At step **202**, inserter system **306** scans a barcode on a document and ISC1 sends to OMS **304** a request for a data block corresponding to the MRDF ID and mailpiece ID scanned. If, at step **204**, data is available for the mailpiece ID and, at step **206**, the mailpiece ID has not already been processed, the OMS **304** makes an MRDF block **310** and a log file **312** and sends a block allocated confirmation to ISC1, at step **210**. If, at step **204**, data is not available for the mailpiece ID or, at step **206**, the mailpiece ID has already been processed, then, at step **208** block allocation is denied by OMS **304**. At step **212**, ISC1 uses MRDF data from MRDF block **310** to create the mailpiece, logs the results of the mailpiece creation in log file **312**, and requests a new data block based on the next mailpiece ID scanned. The MRDF processing for ISC1 repeats steps **204–212** until the last mailpiece in the MRDF is processed or the OMS **304** communicates otherwise.

At step **214**, inserter system **308** scans a barcode on a document and ISC2 sends to OMS **304** a request for a data block corresponding to the MRDF ID and mailpiece ID scanned. If, at step **216**, data is not available for the mailpiece ID or, at step **220**, the mailpiece ID has already been processed, then at step **218** or step **222** respectively, allocation is denied. If data is available for the mailpiece ID and the mailpiece ID has not already been processed, then, at step **224**, OMS **304** determines if ISC2 is requesting a block of data beginning with a mailpiece ID in the block already allocated to ISC1. If not already allocated to ISC1, the process continues at step **236** which is described below.

If allocated to ISC1, at step **228**, OMS **304** requests ISC1 to stop at a mailpiece immediately before the mailpiece requested by ISC2. At step **230**, ISC1 responds whether it has processed the mailpiece requested by ISC2. If it has, at step **232**, ISC1 continues processing its current block and OMS **304** denies ISC2's request because duplicate mailpieces have been detected. If ISC1 has not processed the mailpiece requested by ISC2, at step **234**, ISC1 sets a new end of block at the piece before the mailpiece requested by ISC2.

At step **236**, OMS **304** allocates an MRDF block **320** and creates a log file **322** and sends a block allocated confirmation to ISC2. At step **238**, ISC2 uses MRDF data from MRDF block **320** to create the mailpiece, logs the results of the mailpiece creation in log file **322**, and requests a new data block based on the next mailpiece ID scanned. The MRDF processing for ISC2 repeats steps **214–240** until the last mailpiece in the MRDF is processed or the OMS **304** communicates otherwise. At step **240**, ISC1 and ISC2 continue respective data block processing to the end of respective data blocks, at which time ISC1 and ISC2 request new blocks respectively, at step **242**. At the end of all MRDF processing, at step **244**, OMS **304** consolidates all allocated blocks for ISC1 and ISC2 and determines whether any mailpieces were not processed. OMS **304** creates a file reflecting missing mailpieces.

As previously described, OMS **304** controls duplicate block/piece detection across multiple inserter systems. The following description is for more than two inserter systems performing the MRDF processing of a mail run. When ISC2 requests a block of starting with a mailpiece ID that is already in a block that has been processed by one of the other ISCs (as shown in FIGS. **7** and **10**, ISC1), OMS **304** determines duplicate material immediately and denies the download request to ISC2. ISC2 automatically clears the deck of inserter system **308** and processes the cleared mailpiece accordingly. When ISC2 requests a block starting with a mailpiece ID in a block that is in process on another ISC (as shown in FIGS. **8** and **9**, ISC1), OMS **304** sends a message to the ISC1, requesting ISC1 to stop at the mailpiece before the mailpiece ID in the request. The response by ISC1 depends on whether the mailpiece has already been processed. If the mailpiece has not been processed, the ISC1 sets a new end of block to the mailpiece immediately preceding the requested piece, and OMS **304** downloads the requested block to ISC2. If the mailpiece has been processed by ISC1, ISC2 receives a download denied response from OMS **304** which indicates duplicate material. ISC2 automatically clears deck and process the mailpiece accordingly.

In the preferred embodiment of the present invention, each ISC, for example ISC1 or ISC2, detects duplicate or missing material within a data block, **310** or **320**, allocated by the OMS. Each ISC can be programmed to allow a predetermined number of missing pieces to be detected and marked as missing without stopping the inserting system. Likewise, the ISC can be programmed to identify a predetermined number of duplicates that can be outsorted from further processing.

Whenever an inserting system deck is cleared at by an ISC, the ISC sends a last mailpiece processed message to OMS **304** with the correct last mailpiece ID. This produces an automatic download of a block to the ISC from the OMS when the inserter system is restarted by an operator. If the clear deck is initiated because the inserter system detects an end of block, the inserter system closes the current block, restarts automatically after deck is cleared and requests a new block.

Log files, for example 312 and 322, are created at OMS 304, for each MRDF block. In the preferred embodiment, the log files are copies of the MRDF with a result field added and initialized to 20. Table I represents codes used in the result field.

Table I

Result Codes
0-processed at ISC
1-damaged on input
2-lost on output
4-damaged on chassis
6-never seen on input
10-OMS close MRDF piece
20-OMS initialize

In the preferred embodiment, the log files are initially placed in the ISC home directory in OMS 304. When the ISC sends last block message for a block, the OMS copies the block and the log files into a custom subdirectory in OMS 304 with an appropriate MRDF name and deletes the block and log files from the ISC home directory.

An exception file, which may be located in the same custom subdirectory, consists of a log of all mailpieces not marked with 0 in the result fields when the MRDF is closed. This file is used for the regeneration of mailpieces.

While the present invention has been disclosed and described with reference to a single embodiment thereof, it will be apparent, as noted above, that variations and modifications may be made therein. It is, thus, intended in the following claims to cover each variation and modification that falls within the true spirit and scope of the present invention.

What is claimed is:

1. A method of processing a mail run on a plurality of inserter systems, said plurality of inserter systems including first and second inserter systems, the method comprising the steps of:

generating a mail run data file (MRDF) reflecting mailpieces of a mail run to be processed;

downloading the MRDF to a file server;

scanning documents at each of the plurality of inserter systems, each of the documents being scanned for an MRDF ID and a mailpiece ID;

requesting respectively an MRDF data block from the file server based on the scanned MRDF ID and mailpiece ID at each of the plurality of inserter systems;

verifying for the respective requests from each of the inserter systems that data is available for the requested mailpiece ID and that the requested mailpiece ID has not been processed by any of the plurality of inserter systems;

allocating the requested MRDF data block respectively to each of the inserter systems when the data is available and the requested mailpiece has not been processed;

using mailpiece data from the respective MRDF data block to create a mailpiece at each of the plurality of inserter systems.

2. The method of claim 1, further comprising the steps of:

denying allocation of the MRDF data block requested by a first inserter system when the data is not available; and

denying allocation of the MRDF data block requested by the first inserter system when the requested MRDF data block has already been processed by a second inserter system.

3. The method of claim 1, further comprising the steps of:

determining whether the MRDF data block requested by a first inserter system has been allocated to a second inserter system;

requesting the second inserter system to stop processing its data block at a mailpiece prior to the mailpiece ID requested by the first inserter system;

continuing the second inserter system processing when the second inserter system has process the mailpiece corresponding to the mailpiece ID;

denying the request of the first inserter system to prevent the processing of duplicate mailpieces.

4. The method of claim 1, further comprising the steps of:

determining whether the MRDF data block requested by a first inserter system has been allocated to a second inserter system;

requesting the second inserter system to stop processing its data block at a mailpiece prior to the mailpiece ID requested by the first inserter system;

acknowledging and responding at the second inserter system to the request to stop processing at a mailpiece prior to the mailpiece ID requested by the first inserter system;

allocating the requested data block to the first inserter system; and

creating a log file for the first inserter system.

5. A system for processing mailpieces of a mail run on a plurality of inserters, comprising:

a first processor including means for generating documents for the mailpieces of the mail run, said first processor including means for generating a mail run data file (MRDF) reflecting the mailpieces of the mail run;

a second processor operatively coupled to the first processor, said first processor downloading said MRDF to said second processor;

controller means in each of the plurality of inserters for controlling the processing of the documents to form the mailpieces of the mail run, each of said controller means being operatively coupled to the second processor, wherein each of said controller means initiates requests to the second processor for MRDF data based on information relating to a particular mailpiece of the mail run, such information being scanned from documents processed on a respective one of said plurality of inserters, and wherein said second processor provides the requested data to the requesting one of said controller means when the requested data is in the MRDF and the mailpiece to which the requested data relates has not been processed by another one of said plurality of inserters, whereby each of said inserters processes the documents in accordance with the MRDF data received to create certain ones of the mailpieces of the mail run.

6. The system of claim 5, wherein the information scanned from the documents includes an MRDF ID and a mailpiece ID, said second processor creating an MRDF mailpiece data block for each mailpiece ID and allocating said MRDF mailpiece data block to the requesting one of said controller means.

7. The system of claim 6, wherein said second processor creates for each of said controller means a mailpiece log file into which results of each mailpiece creation by respective ones of said controller means is logged.

8. The system of claim 7, wherein said second processor denies allocation of a requested MRDF mailpiece data block

to the requesting one of said controller means when MRDF data is not available in the MRDF for a particular scanned mailpiece ID.

9. The system of claim 8, wherein said second processor denies allocation of said requested MRDF mailpiece data block to the requesting one of said controller means when said requested MRDF mailpiece data block has already been allocated to another one of said controller means and said another one of said controller means has already commenced processing of a mailpiece corresponding to said requested MRDF mailpiece data block.

10. The system of claim 8, wherein said second processor allocates said requested MRDF mailpiece data block to the requesting one of said controller means when said requested MRDF mailpiece data block having already been allocated to said another one of said controller means and said another one of said controller means acknowledges to said second processor that said another one of said controller means has not commenced processing of a mailpiece corresponding to said requested MRDF mailpiece data block and that said another one of said controller means will stop processing at a mailpiece before said mailpiece corresponding to said requested MRDF mailpiece data block.

11. The system of claim 7, wherein said second processor creates an exception file at the end of the mail run, said exception file being based on results stored in the plurality of log files for the MRDF processing, said exception file including missing mailpieces and damaged mailpieces.

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US005448490A

United States Patent [19]

Gottlieb et al.

[11] Patent Number: 5,448,490

[45] Date of Patent: Sep. 5, 1995

[54] **SYSTEM AND METHOD FOR TWO LEVEL REAL-TIME CONTROL FOR AN INSERTING MACHINE**

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[73] Assignee: **Pitney Bowes Inc.**, Stamford, Conn.

[21] Appl. No.: **36,134**

[22] Filed: **Mar. 23, 1993**

[51] **Int. Cl.**[6] **G06F 15/00**; G08B 21/00

[52] **U.S. Cl.** **364/478**; 364/138

[58] **Field of Search** 364/471, 478, 138, 131

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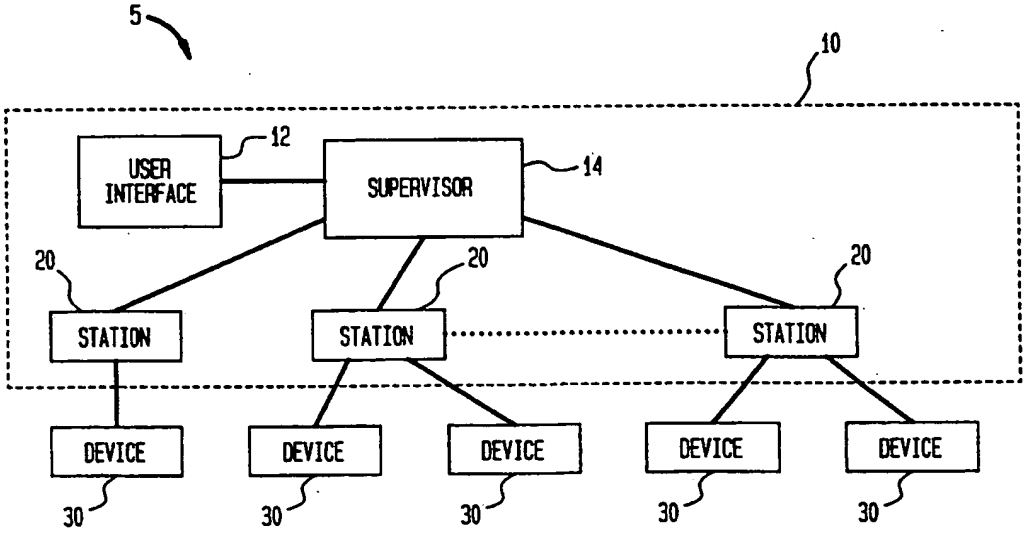
Attorney, Agent, or Firm—Charles R. Malandra, Jr.; Melvin J. Scolnick

[57] **ABSTRACT**

A method and improved system for controlling an inserter having a plurality of functional devices, including the steps providing a control system that divides the inserter into a plurality of logical stations each of which control at least one of the functional devices, separating the control system into a top-level, generic supervisor which is operative independent of the functional devices, and a lower level comprising the logical stations, and storing the supervisor and the logical stations in a central processor, the supervisor being operative for selecting an appropriate one of the logical stations at an appropriate time whereby the selected one of the logical stations controls a corresponding one of the functional devices. The method further includes the steps of providing a plurality of distributed processors electrically coupled to the central processor and associated with the functional devices, and controlling the functional devices by the logical stations through the distributed processors.

11 Claims, 5 Drawing Sheets



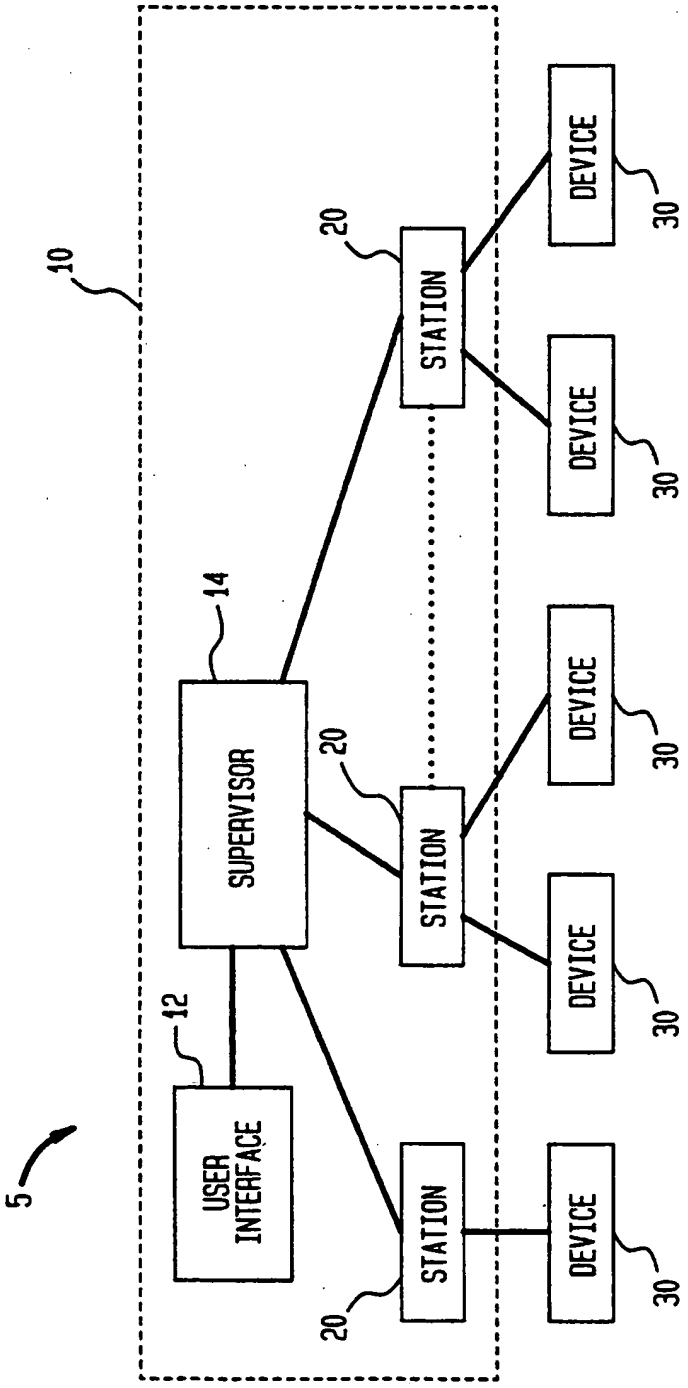


FIG. 1

FIG. 2

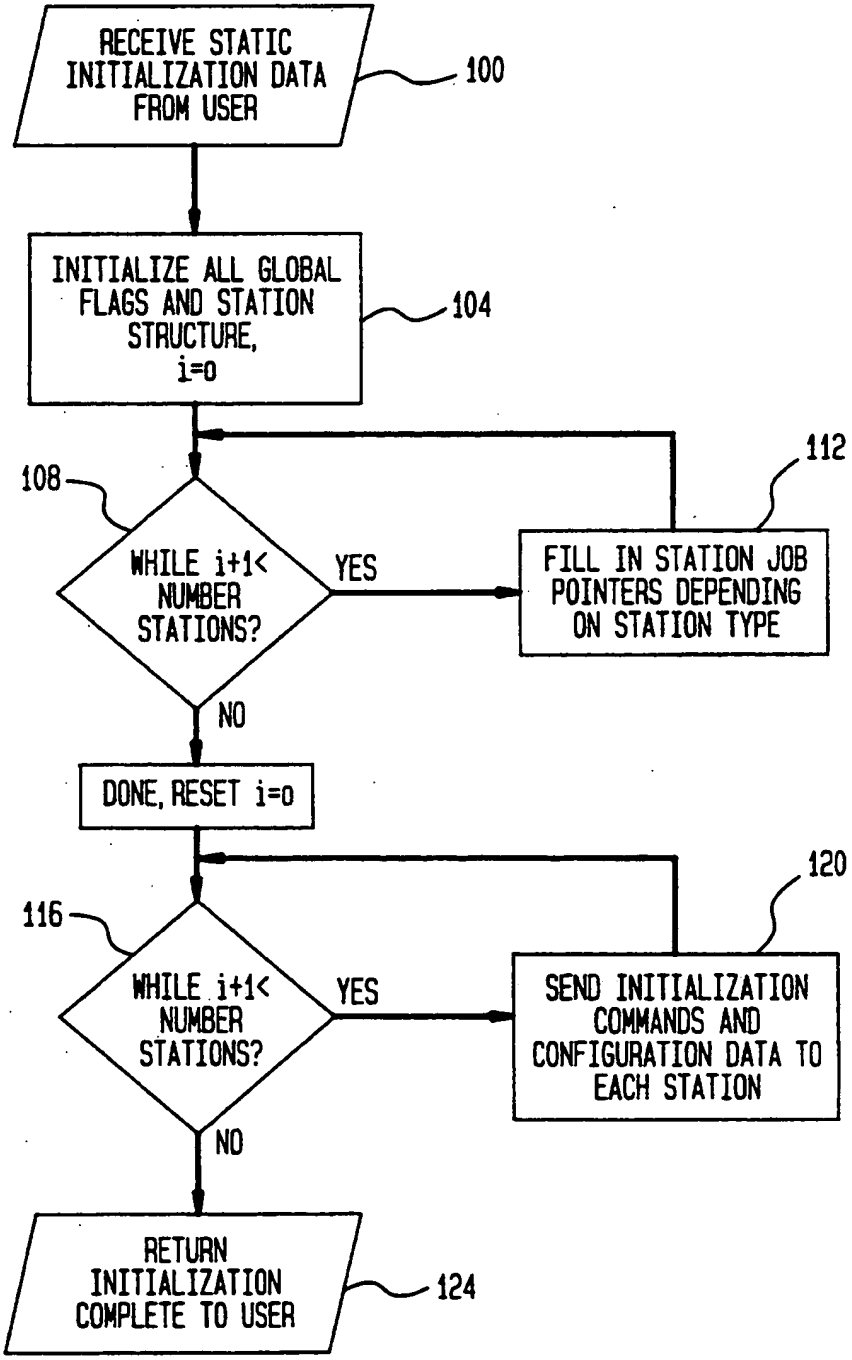

RECEIVE STATIC INITIALIZATION DATA FROM USER
100
INITIALIZE ALL GLOBAL FLAGS AND STATION STRUCTURE, i=0
104
108
WHILE i+1< NUMBER STATIONS?
YES
112
FILL IN STATION JOB POINTERS DEPENDING ON STATION TYPE
NO
DONE, RESET i=0
116
WHILE i+1< NUMBER STATIONS?
YES
120
SEND INITIALIZATION COMMANDS AND CONFIGURATION DATA TO EACH STATION
NO
RETURN INITIALIZATION COMPLETE TO USER
124

FIG. 3

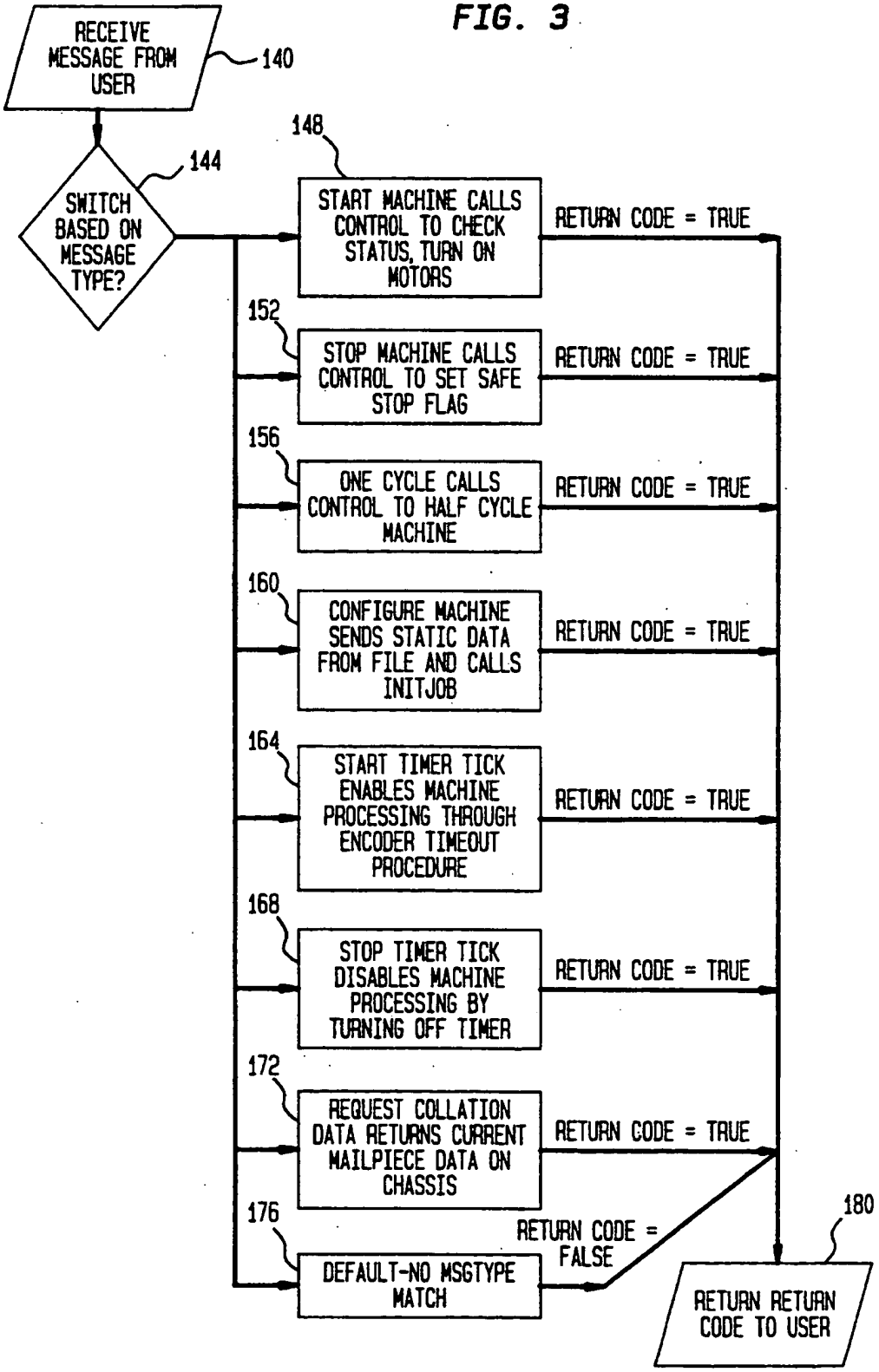

RECEIVE MESSAGE FROM USER
140
SWITCH BASED ON MESSAGE TYPE?
144
148
START MACHINE CALLS CONTROL TO CHECK STATUS, TURN ON MOTORS
RETURN CODE = TRUE
152
STOP MACHINE CALLS CONTROL TO SET SAFE STOP FLAG
RETURN CODE = TRUE
156
ONE CYCLE CALLS CONTROL TO HALF CYCLE MACHINE
RETURN CODE = TRUE
160
CONFIGURE MACHINE SENDS STATIC DATA FROM FILE AND CALLS INITJOB
RETURN CODE = TRUE
164
START TIMER TICK ENABLES MACHINE PROCESSING THROUGH ENCODER TIMEOUT PROCEDURE
RETURN CODE = TRUE
168
STOP TIMER TICK DISABLES MACHINE PROCESSING BY TURNING OFF TIMER
RETURN CODE = TRUE
172
REQUEST COLLATION DATA RETURNS CURRENT MAILPIECE DATA ON CHASSIS
RETURN CODE = TRUE
176
DEFAULT-NO MSGTYPE MATCH
RETURN CODE = FALSE
180
RETURN RETURN CODE TO USER

FIG. 4

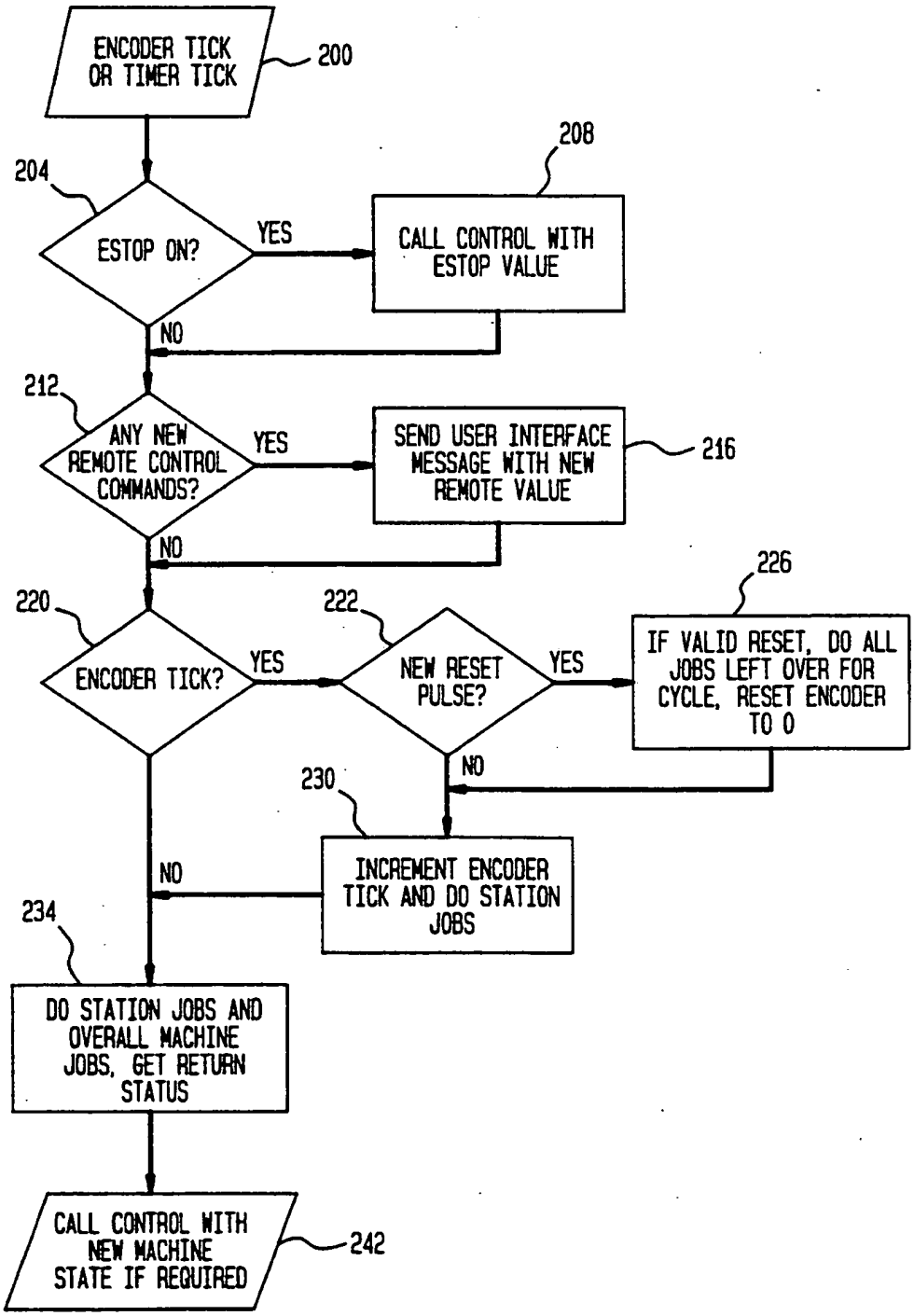
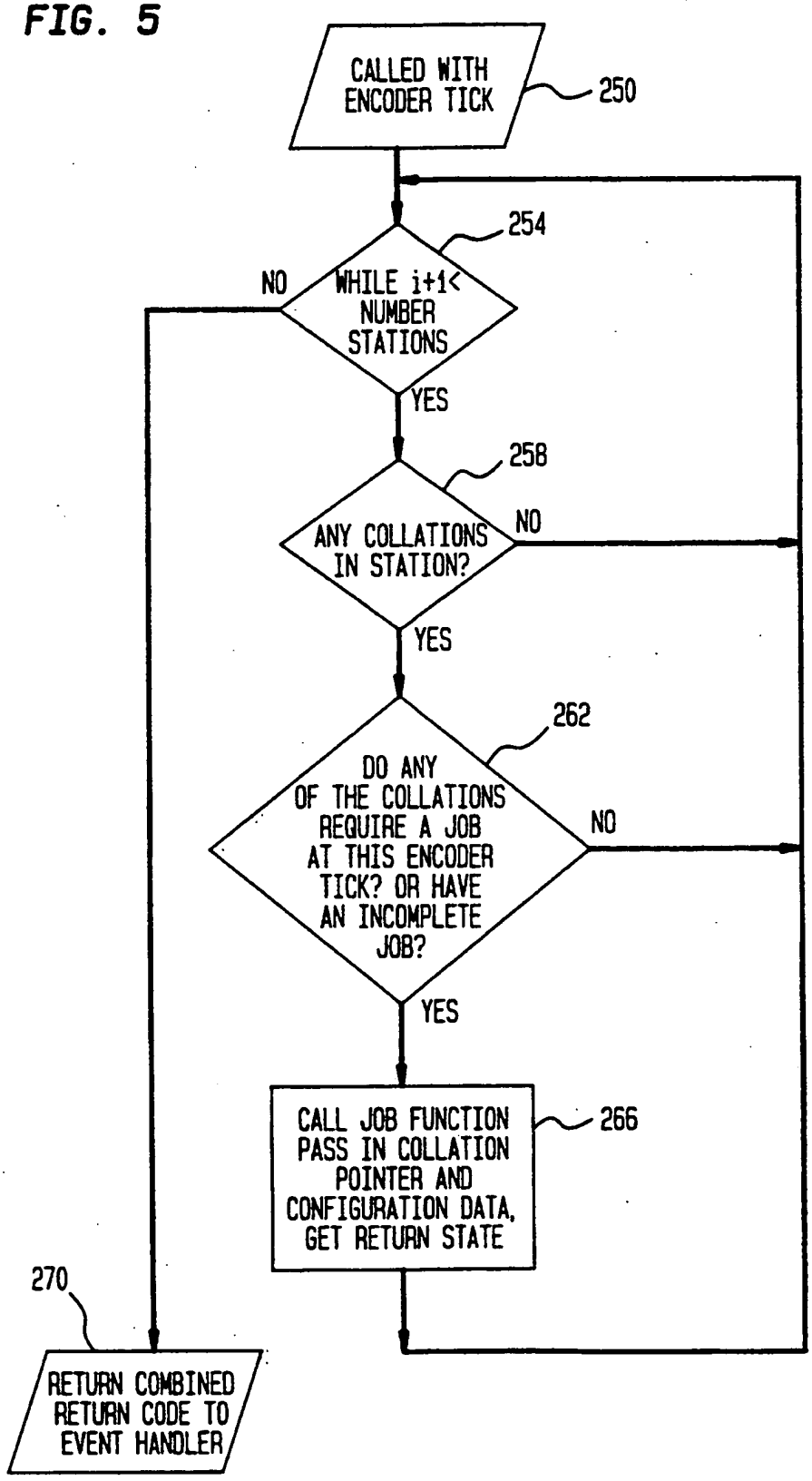

ENCODER TICK OR TIMER TICK
200
204
ESTOP ON?
YES
208
CALL CONTROL WITH ESTOP VALUE
NO
212
ANY NEW REMOTE CONTROL COMMANDS?
YES
SEND USER INTERFACE MESSAGE WITH NEW REMOTE VALUE
216
NO
220
ENCODER TICK?
YES
222
NEW RESET PULSE?
YES
226
IF VALID RESET, DO ALL JOBS LEFT OVER FOR CYCLE, RESET ENCODER TO 0
NO
230
INCREMENT ENCODER TICK AND DO STATION JOBS
NO
234
DO STATION JOBS AND OVERALL MACHINE JOBS, GET RETURN STATUS
CALL CONTROL WITH NEW MACHINE STATE IF REQUIRED
242

FIG. 5


CALLED WITH ENCODER TICK
250
254
WHILE i+1< NUMBER STATIONS
NO
YES
258
ANY COLLATIONS IN STATION?
NO
YES
262
DO ANY OF THE COLLATIONS REQUIRE A JOB AT THIS ENCODER TICK? OR HAVE AN INCOMPLETE JOB?
NO
YES
CALL JOB FUNCTION PASS IN COLLATION POINTER AND CONFIGURATION DATA, GET RETURN STATE
266
270
RETURN COMBINED RETURN CODE TO EVENT HANDLER

SYSTEM AND METHOD FOR TWO LEVEL REAL-TIME CONTROL FOR AN INSERTING MACHINE

FIELD OF THE INVENTION

The invention disclosed herein relates generally to inserter systems. More particularly, this invention relates to control systems for multi-station inserter systems.

BACKGROUND OF THE INVENTION

Inserter systems, which assemble batches of documents for insertion into envelopes, are known in the art and are generally used by organizations which make large mailings where the contents of each envelope may vary. Large multi-station inserter systems typically include some or all of the following: a plurality of feeder modules for feeding sheets into a batch; a web module for separating webs into discreet sheets and feeding the discrete sheets into the batch; folder modules for folding individual sheets or batches; an envelope module for feeding envelopes into which the batches are to be inserted; a transport system for conveying the batches through the various modules of the inserter system; an insertion module for inserting the batches into envelopes; and meter modules for metering the filled envelopes with appropriate postage. Additionally, multi-station inserter systems may include modules for assembling a collation of sheets fed from a feeder module for further processing, and modules for turning the sheets or envelopes for further processing. A control system is used to synchronize the operation of the various modules in the inserter system to assure that the batches are properly assembled, inserted into envelopes and, possibly, metered, at a high rate.

Although the types of modules used in the inserter system are generally standardized, the configuration of the inserter systems are not. Typically, the multi-station inserter systems are configured to meet a particular application of each customer. Thus, the configuration of such inserter systems varies depending on the customer and the particular application for the inserter system by the customer. In customizing large inserter systems using generally standardized modules the flexibility of the control system to easily adapt to any configuration changes is most important.

In U.S. Pat. No. 4,547,856, issued on Oct. 15, 1985 to Piotroski et al., and assigned to the assignee of the present invention, there is disclosed a universal multi-station document inserter, including a central processor interconnected to a plurality of distributed processors associated with the inserter modules. A supervisory program operating in the central processor controls the modules of the inserter in accordance with instructions programmed into the distributed processors associated therewith. The supervisory program capable of running all the modules of the inserter and performing all control functions is stored in plug-in PROMS which are coupled to the central processor. An additional PROM couple to the central processor includes a data table which specifies a particular inserter configuration and the functions to be performed for that configuration by the executable routines in the supervisory program.

An example of a known method for customizing a multi-station inserter is provided in U.S. Pat. No. 4,497,040, issued Jan. 29, 1985 to Gomes et al., and assigned to the assignee of the present invention.

By using the foregoing format, it was thought that there would be no need to change any of the executable programs in the central processor, and that the same supervisory program could be incorporated into the central processor of each multi-station inserter. This was certainly the case for modules that were known at the time the supervisory program was developed. However, as new modules were developed it became clear that, at least for certain new modules, the supervisory program had to be revised to be capable of running the new modules and performing the control functions for the new module. Such revision to the supervisory program not only required verification of the revised portions but also required a reverification of the entire supervisory program to ensure that the revision had not effected the performance of the supervisory functions.

It is an object of the present invention to provide a supervisory control system that can be more easily adapted to handle new modules in an inserter configuration.

It is a further object of the present invention to provide a supervisory control system that facilitates adding modules that perform new functions in an inserter system.

SUMMARY OF THE INVENTION

In accordance with the present invention, an inserter control system is made up of two levels of processing. The top level of processing is referred to as a "supervisor". The supervisor is a generic part of the control system that can be used on inserter systems of any configuration. The lower level of processing is referred to as a "station". The supervisor controls the inserter as a group of logical stations. Each station is configured for independent handling of collations. The supervisor sends appropriate data and commands to each station for processing a current collation at that station.

Thus, the present invention provides a system and method for controlling an inserter system as a series of independent stations. Each station is configured independently from a data file containing a set of configuration parameters for each station. In addition there is a library of functions which define the processing that occurs at each station. This library of functions may include processing that occurs within a central processor, as well as functions that communicate with distributed processors associated with the various stations.

It has been found that the present invention provides the ability to configure easily an inserter system including new modules being controlled by the control system. It has also been found that the top level supervisor does not need to be revised when a new module is added to the inserter system. Only the lower level station that corresponds to the new module must be verified.

The control system is initialized by reading a configuration file which is preferably stored in permanent storage such as the hard drive of the central processor. The data contained in the file relates to a particular machine that the control system is going to run. All stations and attributes of the stations are fully defined in this file. Stations can be added or deleted through the configuration file. As the configuration file is read into the system, the "image" of the machine is built in data tables located in memory of the central processor. This "image" reflects the number and types of stations defined in

the configuration file. New types of stations can be added through the configuration file in conjunction with linking to station file libraries.

The supervisor receives initialization data, which includes the type of station at each position in the inserter system, as well as functions that will be performed at each station while documents are being processed. A global station table includes a record for each station that is configured for the particular inserting machine. Each type of station (such as a feed station, insert station or envelope station) will have its own standard set of parameters that is entered into the table at an appropriate table position corresponding to the location of such station in the inserter system. Additional configuration commands are sent to identify appropriate data paths for communication errors, status messages and collation data.

The supervisor provides a generic method for processing through the global station table which allows the stations to process independently. The table is processed based on real-time input indicating that an "event" has occurred, such as encoder position ticks from the inserter. When the event occurs, an event handler is called, which then calls a table processing function. Each function is called when an appropriate event, such as the encoder tick, has occurred. The supervisor has no knowledge of the actual processing that occurs for each function. All functions return standard values which are used by the supervisor in controlling the overall inserter. These values are handled by the event handler and passed to a function that monitors the running status of the inserter.

The independent functions are passed a station identification (Id) for accessing the configuration data for that station, and a pointer to the data for a collation that is currently located in the station. Using this information, the function can do its processing, independent of the rest of the control system. The station Id is required since the same function can be used several times in a system, for example there may be a plurality of a particular type of feeder module in an inserter. There is a generic function used by each station for passing data to the next station. All data for communications between stations is stored within the collation records that are passed from station to station through the inserter.

The collation data contains all of the dynamic information related to the processing of that particular collation. As a collation pointer is passed through the stations, the data will be updated with the stations information, including scanning data and error codes. Thus, with the stations configuration data, plus the dynamic collation data, stations can process collations independent of the rest of the inserter system.

The supervisor receives a limited set of commands from the user interface. In addition to the configuration commands, the user can command the machine to start and stop. There are also diagnostic commands which can be run. Once the machine has been started, no input is required form the user interface to run the inserter. Periodically, data, such as piece counts, cycle speeds and error conditions, are sent to the user interface for display. When a collation has reached the end of the inserter processing, the data for that collation is sent to the user interface for logging.

Errors are processed according to a configuration definition for each error. The actions available for processing an error are dependent on the modules present in the inserter system. For example, a station may stop the inserter every time an error occurs, after a configurable number of times an error occurs in a row, or a special output handler may be used. The machine code generates error messages when the inserter must stop of operator intervention is required to rectify the problem causing the error.

In accordance with the present invention a method and improved system for controlling an inserter having a plurality of functional devices includes the steps providing a control system that divides the inserter into a plurality of logical stations each of which control at least one of the functional devices, separating the control system into a top-level, generic supervisor which is operative independent of the functional devices, and a lower level comprising the logical stations, and storing the supervisor and the logical stations in a central processor, the supervisor being operative for selecting an appropriate one of the logical stations at an appropriate time whereby the selected one of the logical stations controls a corresponding one of the functional devices. The method further includes the steps of providing a plurality of distributed processors electrically coupled to the central processor and associated with the functional devices, and controlling the functional devices by the logical stations through the distributed processors.

DESCRIPTION OF THE DRAWINGS

The above and other objects and advantages of the present invention will be apparent upon consideration of the following detailed description, taken in conjunction with accompanying drawings, in which like reference characters refer to like parts throughout, and in which:

FIG. 1 is a block diagram of a two level machine control system architecture for an inserting machine in accordance with the present invention;

FIG. 2 is a flow chart of an initialization of the high level section of the machine control system of FIG. 1;

FIG. 3 is a flow chart of a message handler for a user interface to the machine control system;

FIG. 4 is a block diagram of an event handler for the machine control system; and

FIG. 5 is a block diagram of a job table processing loop for the machine control system.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

In describing the present invention, reference is made to the drawings, wherein there is seen in FIG. 1 a diagram of a machine control system in accordance with the present invention. A detailed description of a multistation inserter system including a control system comprising a central processor and distributed processors is provided in U.S. Pat. No. 4,547,856 issued Oct. 15, 1985 to Piotroski et al., and assigned to the assignee of the present invention, which is hereby incorporated by reference.

The inserting machine 5 is made up of stations which contain one or more devices. All interaction with machine control system 10 is through a user interface 12. In addition to sending signals input by an operator, user interface 12 also sends data, such as configuration data, based on inputs by the operator.

Device 30 represents a physical device in the machine that performs a function which a station 20 can control. Examples of such physical devices in an inserting machine are a feeder and an optical scanner. Station 20 is a logical device that to corresponds to one or more de-

vices 30 that cannot be access separately. An example of a device 30 corresponding to station 20 is a feeder module comprising a feeder and an optical scanner as Devices. The supervisor 14 represents a generic high level section of the machine control system 10 that is independent of the devices 30 that make up the machine. Stations 20 represent a lower level section of the machine control system 10 that provides the direct control of the devices 30. Supervisor 14 commands and coordinates the interactions among the stations 20.

Referring now to FIG. 2, the initialization of supervisor 14 is shown. At step 100, supervisor 14 receives static initialization data from the user interface 12. At 104, supervisor 14 initializes all global flags and table of each station 20.

The station 20 table includes station records which contain complete information for each station 20 in the machine. For example, a station records include static station data, such as, station type, scanner configuration and feed count, that relates to the devices 30 controlled by the station 20. Further, each station record includes pointers to a list of functions that are performed by the devices 30 controlled by the station and a list of when to perform the functions. Finally, each station record includes collation data pointers when a collation is in the realm of the device 30 controlled by the station 20. Each station has access only to the collation within the realm of that station.

At 108 and 112, supervisor 14 initializes station job pointers. Each station may include a unique set of jobs which correspond to the station types, such as, feeder, folder, etc. However, each station 20 must include a send-to-next-station function that passes a collation to the next station 20. Each job includes the same parameters: station Id, collation pointer and encoder tick, which determines when the job is performed.

At 116 and 120, supervisor 14 initializes commands and configuration data to each station 20. At 124, supervisor 14 returns an initialization complete signal to user interface 12, indicating that supervisor 14 is ready to respond to operating commands from user interface 12.

In accordance with the present invention the inserter control system can handle any type of interface between the stations 20 and devices 30. In fact, the control system can control a machine including different interfaces to different devices 30. This is possible because for each station, the station table includes station records that contain complete information for every station in the machine. Since each station is a unique set of jobs using different interfaces for various stations is possible because a routine for an interface is encapsulated in the station as one of the jobs for that station. Thus, in accordance with the present invention the routines for the interface(s) reside in the lower level of the machine control system. In previous inserter control systems the interface routines are part of the control system, such as in the PROMS of the control system in U.S. Pat. No. 4,547,856, noted above.

Referring now to FIG. 3, supervisor 14 processes operating command messages received from user interface 12. At 140, a message is received from user interface 12. At 144, supervisor 14 determines the type of message received and directs the message to an appropriate routine at 148 through 172 accordingly. At the completion of the appropriate routine a true signal is returned to the user interface at 180. If supervisor 14 is unable to match the received message to one of the routines 148–172, then a false code is returned to user interface 12 at 176, 180. Supervisor 14 processes operator initiated messages to control the machine: start machine at 148, stop machine at 152 and one cycle at 156. At 160, a configure machine message calls the initialization routine shown in FIG. 2.

Referring now to FIG. 4, a machine event handler of supervisor 14 is shown. The machine event handler is the main processing routine of supervisor 14. At 200, an interrupt from an encoder tick or a timer tick begins the machine event handler. In the preferred embodiment of the present invention encoder ticks create interrupts at a rate of 100 per machine cycle. At 204 and 208, the machine event handler checks for emergency stop. At 212 and 216, the machine event handler checks for a remote control command and sends the user interface a message corresponding to the remote command. If the machine event handler has been called from an interrupt for an encoder tick, and there is no new reset pulse, then at 230, the encoder tick is incremented. If there is a valid reset pulse, then at 226, the machine event handler calls all station jobs remaining for the machine cycle and resets the encoder to zero. At 234, the machine event handler calls the station jobs and overall machine jobs and gets a return status for each job performed. At 242, a new machine state of stop or delay is initiated if required. An encoder timer interrupt occurs every 20 millisecond when the machine is in delay or stop as long as a stop timer tick has not been set.

Referring now to FIG. 5, a job table processing routine is called by the machine event handler in FIG. 4 with an encoder tick interrupt, at 250. At 254, for each station the current encoder tick is compared with the station's job encoder tick. If the current encoder tick is the same or greater than the station's job encoder tick the job may be performed. At 258, there is a check for a collation at station. If no collation is present at the station, the routine returns to 254 for the next station. If a collation is present, at 262, the collation record is checked to determine if the collation requires a job at this encoder tick, or if a previous job remains incomplete. At 266, the job function is called, the collation pointer is passed to the next station. After all stations have been checked, the routine returns to the machine event handler at 270.

In accordance with the present invention there is one station record for each station. It is noted that a station in the software is not necessarily a station as perceived in the hardware. For example, the turntable area may not be a "station" in the inserting machine, but the turntable job for the station controlling the turntable is a collection of functions specific to the turntable.

In the preferred embodiment of the present invention the machine control system can be updated through the operating system whereby station functions can be dynamically linked to the system. For example, a station can be defined to do functions x, y and z even though the supervisor does not know what x, y and z are. When the jobs are loaded into the machine control system, the unique set of jobs for the station include what x, y and z are and when they each occur. Thus, the functions are dynamically linked into the station table and station records. If there is a change in how a particular station feeds, the feed function for that station can be change dynamically without effecting the functions of the other stations. This dynamic link functionality has been in existence for a while, however, in the present invention it is part of a real time control system for an inserter.

In operation, when the inserting machine is turned on a job, such as job A1, is selected by an operator. Job A1 may include functions x, y and z for a device 30*a* that is controlled by a station 20*a*. (The "a" designation is used to show a particular device and station.) Software routines for functions x, y and z are downloaded into the memory that relates to station 20*a*. The data tables for job A1 tell the supervisor 14 what functions x, y, z are.

If device 30 a is a new type of device that is being added to an existing machine, functions x, y, z are added to the dynamic link library of the machine control system. The supervisor 14 knows through the configuration table that a new station 20*a* has been added and that station 20*a* is to execute functions x, y and z. But supervisor 14 does not know what functions x, y and z do. Supervisor 14 only knows that when it is time to do something at station 20*a* functions x, y or z must be called. If new functions a, b and c must later replace functions x, y, z for the station 20*a*, or a new device with functions a, b and c is to be added, then functions a, b and c have to be added to the dynamic link library. Thus, when a new device is developed it can be added to the inserting machine and controlled by the control system without supervisor 14 knowing what hardware, i.e. type of device, it is controlling. This is a direct benefit to a manufacturer of the inserting system because a new device can be added to the machine without any change to the top level supervisor 14. Heretofore, PROM-based configurations, such as in U.S. Pat. No. 4,547,856, have been hard coded in the PROM. Although an operator could override the hard code on a temporary basis in memory, the operator would have to know what functions must be performed to know how to override the hard code. However, in accordance with the present invention once the possible jobs are saved defined and stored, then any of the jobs can be selected and the machine is automatically configured for that job without any further effort by the operator.

Functions x, y and z actually control the device, however, supervisor 14 only knows when to call x, y or z. For example, if device 30*a* is a feeder, x may be feed, y may be read and z may be pause. For one customer, x, y and z are functions for station 20*a*. However for another customer, station 20*a* may be only performing functions x and z. Through dynamic linking, nothing has to be done to the machine to change from the first customer's configuration to the second customer's configuration. In the past, any change in configuration would have required a change to the configuration programmed in a configuration PROM. Thus, the present invention provides an direct benefit to operators of the inserting machine by eliminating such a rigid requirement.

While the present invention has been disclosed and described with reference to a single embodiment thereof, it will be apparent, as noted above that variations and modifications may be made therein. It is also noted that the present invention is independent of the machine being controlled, and is not limited to the control of inserting machines. It is, thus, intended in the following claims to cover each variation and modification that falls within the true spirit and scope of the present invention.

What is claimed is:

1. In a document inserter including a plurality of functional devices and distributed processor means operatively coupled to each of the functional devices, and central processing means connected to the distributed processor means and having stored therein a supervisory program capable of real-time control of all the functional devices, an improvement to the supervisory program comprising:

a top level of processing comprising a supervisor which generically controls the inserter as a group of independent functional devices; and

a lower level of processing comprising a plurality of logical stations that are operatively controlled by said supervisor, each of said stations interfacing with one of the distributed processor means for controlling at least one of the functional devices, wherein each of said stations include a station record containing complete information for the functional devices being controlled thereby.

2. The improvement of claim 1, wherein said station record includes station configuration data, pointers to device functions that are performed by the functional devices and an instant when to perform said device functions, and collation data pointers when a collation is at a functional device controlled by the station.

3. The improvement of claim 2 wherein a user interface sends said configuration data to said supervisor reflecting configuration of the inserter as selected by an operator, said supervisor initializing said stations in accordance with said configuration data.

4. The improvement of claim 3 wherein said supervisor includes a machine event handler that operates on an interrupt basis, said machine event handler calling a particular station to perform a specific one of said device functions based on an interrupt count.

5. The improvement of claim 4 wherein each of said stations send a specific functional signal to an associated functional device at the appropriate time based on the interrupt count matching said instant when to perform said device functions.

6. A method of improved supervisory control of an inserting system including a plurality of functional devices, comprising the steps of:

providing a central processor;

providing a software control system that divides the inserting system into a plurality of logical stations each of which control at least one of the functional devices;

separating the software control system into a top-level, generic supervisor program which is operative independent of the functional devices, and a lower level comprising said logical stations; and

storing said supervisor program and said logical stations in the central processor, said supervisor program being operative for selecting an appropriate one of said logical stations at an appropriate time whereby said selected one of said logical stations controls a corresponding one of said functional devices.

7. The method of claim 6, comprising the further steps:

providing a plurality of distributed processors electrically coupled to the central processor and associated with said functional devices, said logical stations controlling said functional devices through said distributed processors.

8. The method of claim 6, comprising the further steps of:

providing configuration data to said supervisor program through a user interface reflecting a configuration of the inserter; and

initializing said logical stations in accordance with said configuration data.

9. The method of claim 8, comprising the further steps of:

providing a station record for each of said logical stations in the central processor; and

initializing each of said station records with respective station configuration data and pointers to device functions that are performed by the functional devices controlled by the respective logical station.

10. The method of claim 9, comprising the further step of:

keeping track of collations being process in the inserter by collation pointers in said station records.

11. The method of claim 10, comprising the further step of:

calling a particular one of said logical stations at the instant specified in a corresponding one of said station records; and

providing control signals from said particular logical station to a corresponding functional device.

* * * * *

United States Patent [19]

Piotroski et al.

[11] **Patent Number: 4,547,856**

[45] **Date of Patent: Oct. 15, 1985**

[54] **UNIVERSAL MULTI-STATION DOCUMENT INSERTER**

[75] Inventors: **Peter N. Piotroski**, New Canaan; **John M. Gomes**, Bridgeport, both of Conn.

[73] Assignee: **Pitney Bowes Inc.**, Stamford, Conn.

[21] Appl. No.: **394,388**

[22] Filed: **Jul. 1, 1982**

[51] **Int. Cl.**[4] **B65H 39/02**; G08B 21/00

[52] **U.S. Cl.** **364/478**; 364/138; 364/188; 364/471; 270/56; 270/58; 271/3.1; 271/4; 271/259; 53/500; 53/540

[58] **Field of Search** 364/471, 478, 479, 138, 364/146, 188; 270/53, 54, 55, 56, 58, 57; 271/258, 259, 3.1, 4; 53/495, 500, 540, 200, 900

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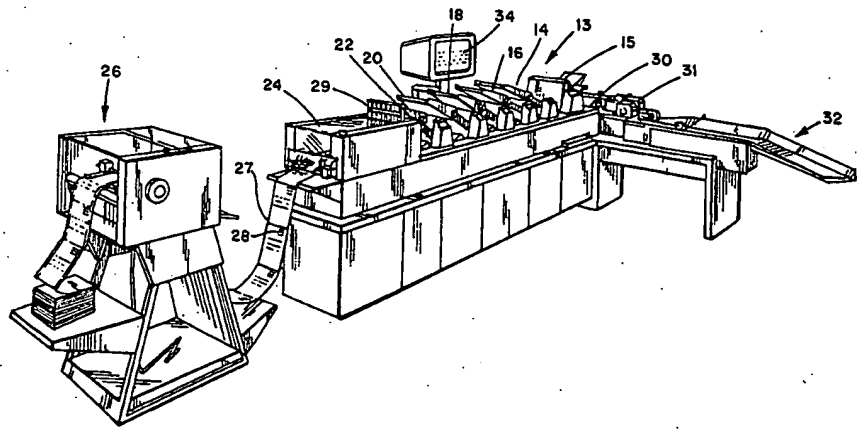
Primary Examiner—Jerry Smith
Assistant Examiner—John R. Lastova
Attorney, Agent, or Firm—Michael J. DeSha; William D. Soltow, Jr.; Albert W. Scribner

[57] **ABSTRACT**

A method and associated apparatus for providing a universal multi-station document inserter, including the steps of providing a plurality of feeder stations for feeding documents in response to signals from a central processor, providing each feeder station with a unique address, storing feeder programs in distributed processors associated with the feeder stations which provide instructions to each feeder station for feeding documents, storing a supervisory program in the central processor which is capable of providing address and command signals to the distributed processors of the feeder stations, and interconnecting the central processor and the distributed processors for the transmission of signals so that upon receipt of the proper address and command signals at the feeder stations, the feeder stations will provide certain document feeding functions under control of the central processor in accordance with instructions programmed into the distributed processors associated therewith.

34 Claims, 68 Drawing Figures

Microfiche Appendix Included
(6 Microfiche, 292 Pages)



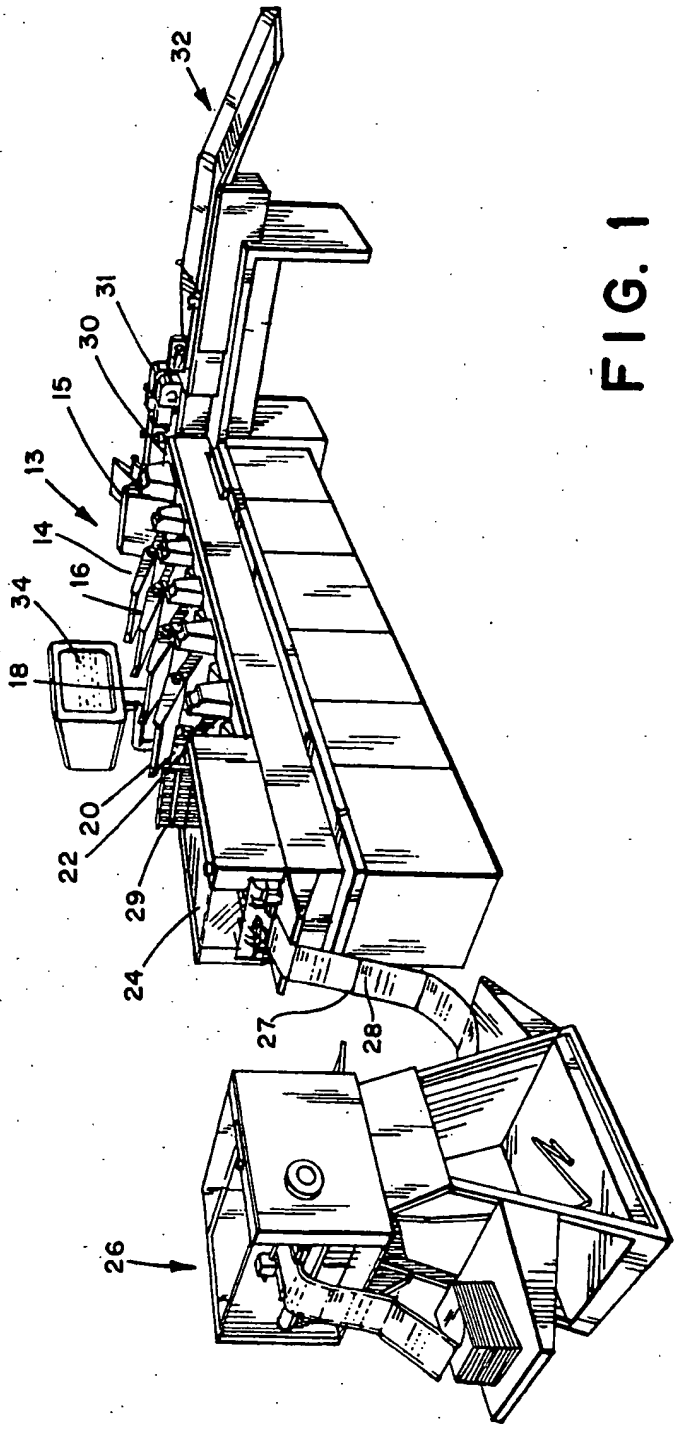
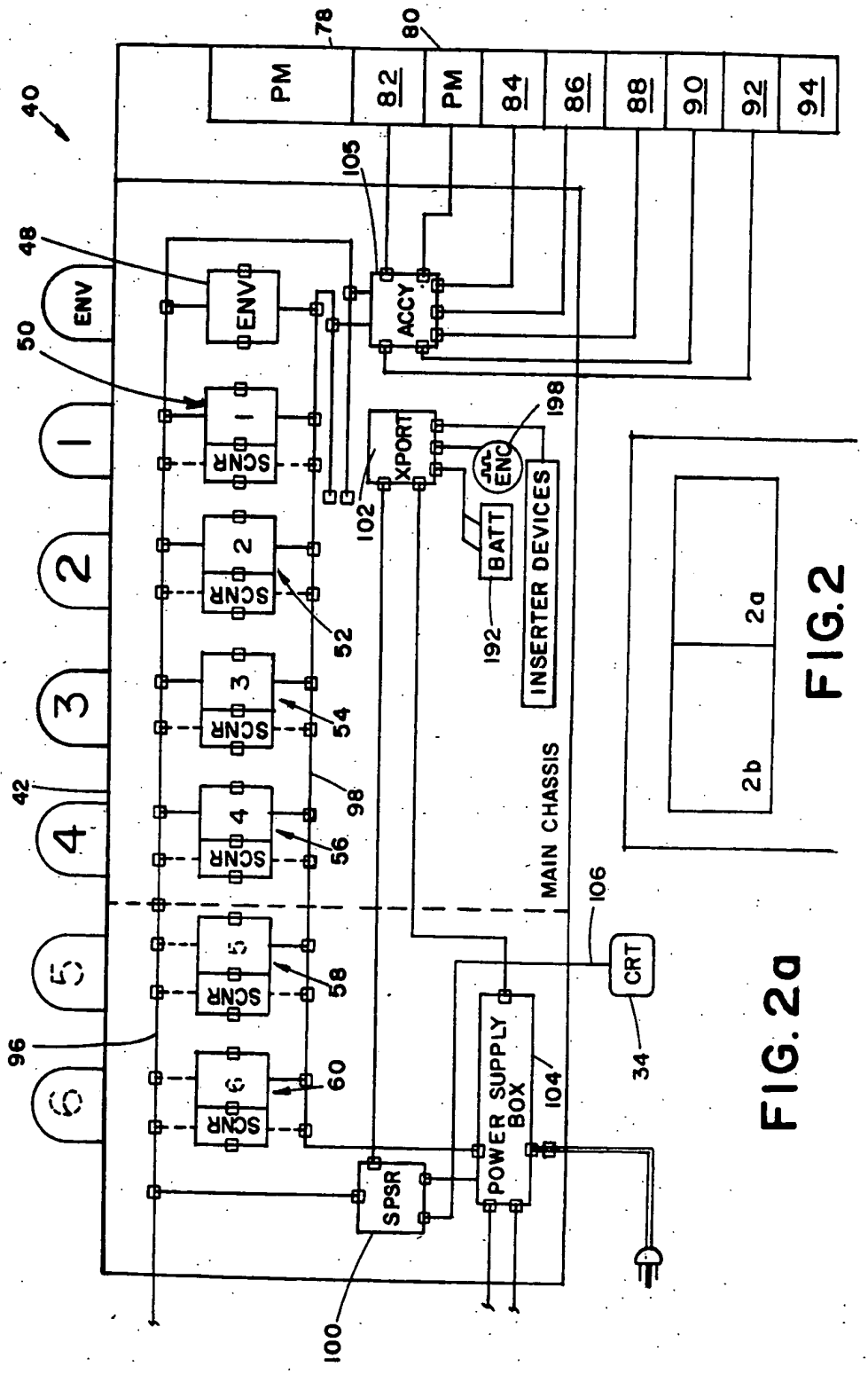


FIG. 1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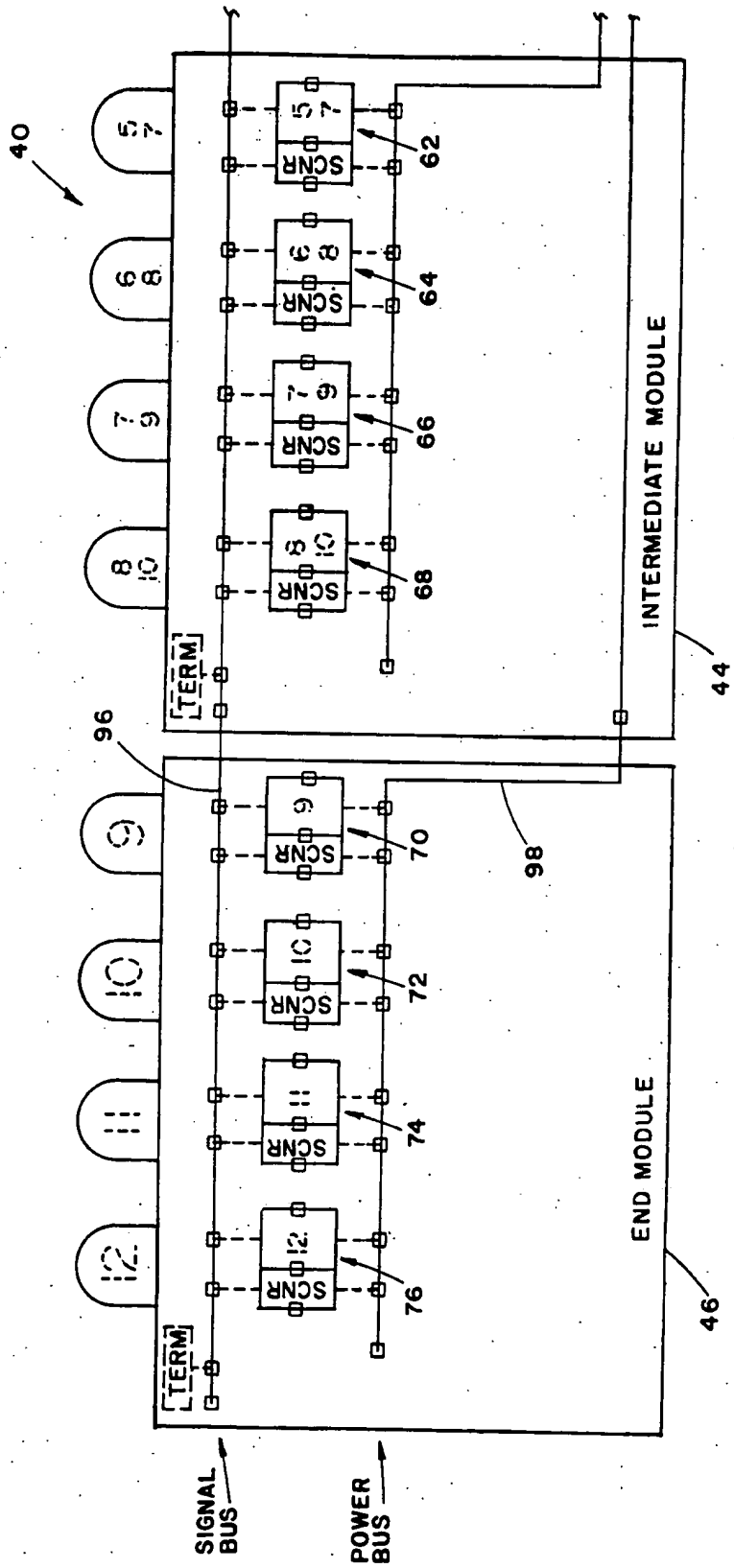
SCNR
56
98
5
SCNR
58
96
6
SCNR
60
ACCY
XPORT
102
198
ENC
BATT
192
INSERTER DEVICES
MAIN CHASSIS
106
CRT
34
POWER SUPPLY BOX
104
SPSR
100
2a
2b

FIG. 2

FIG. 2a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SCNR
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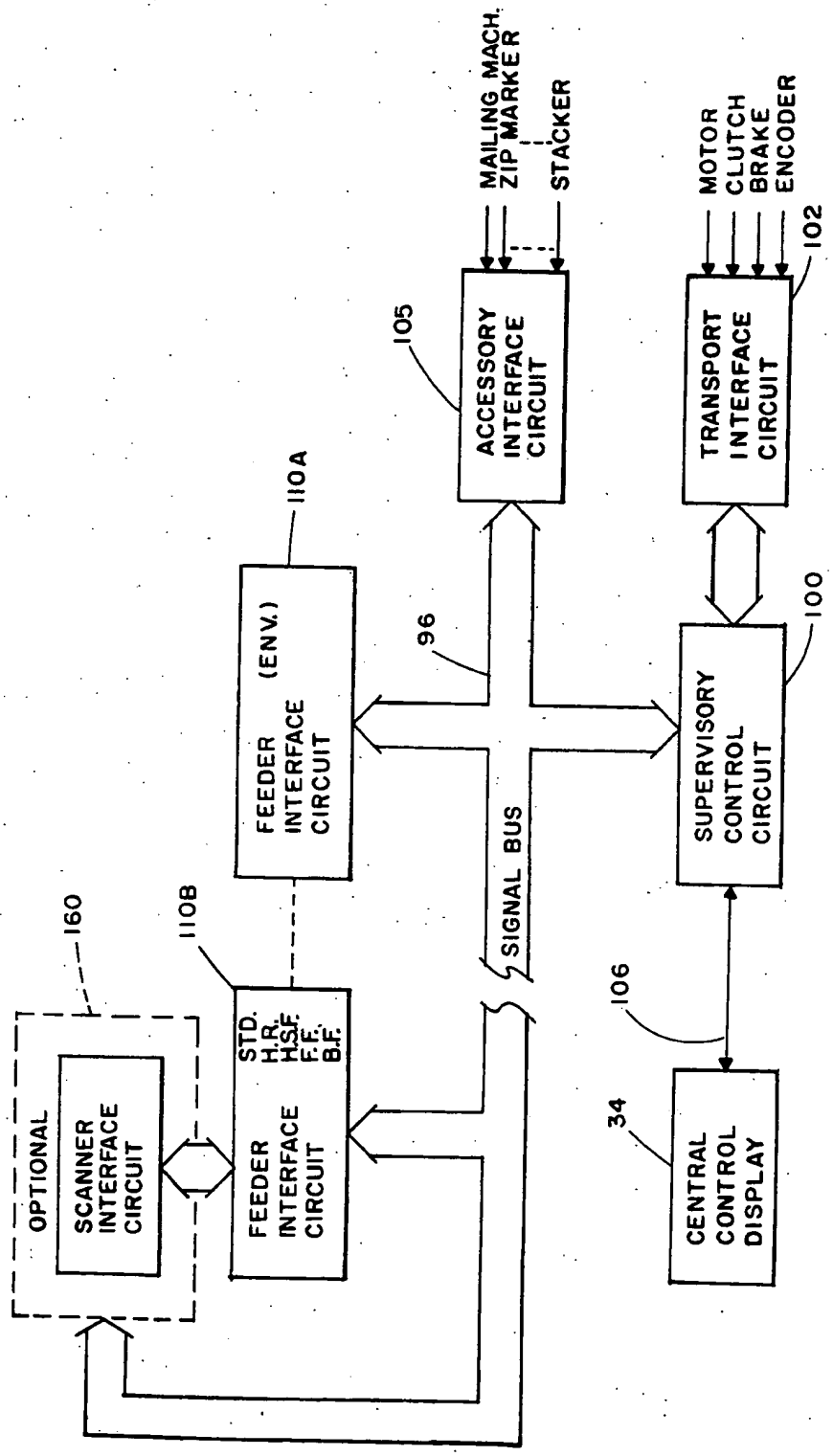
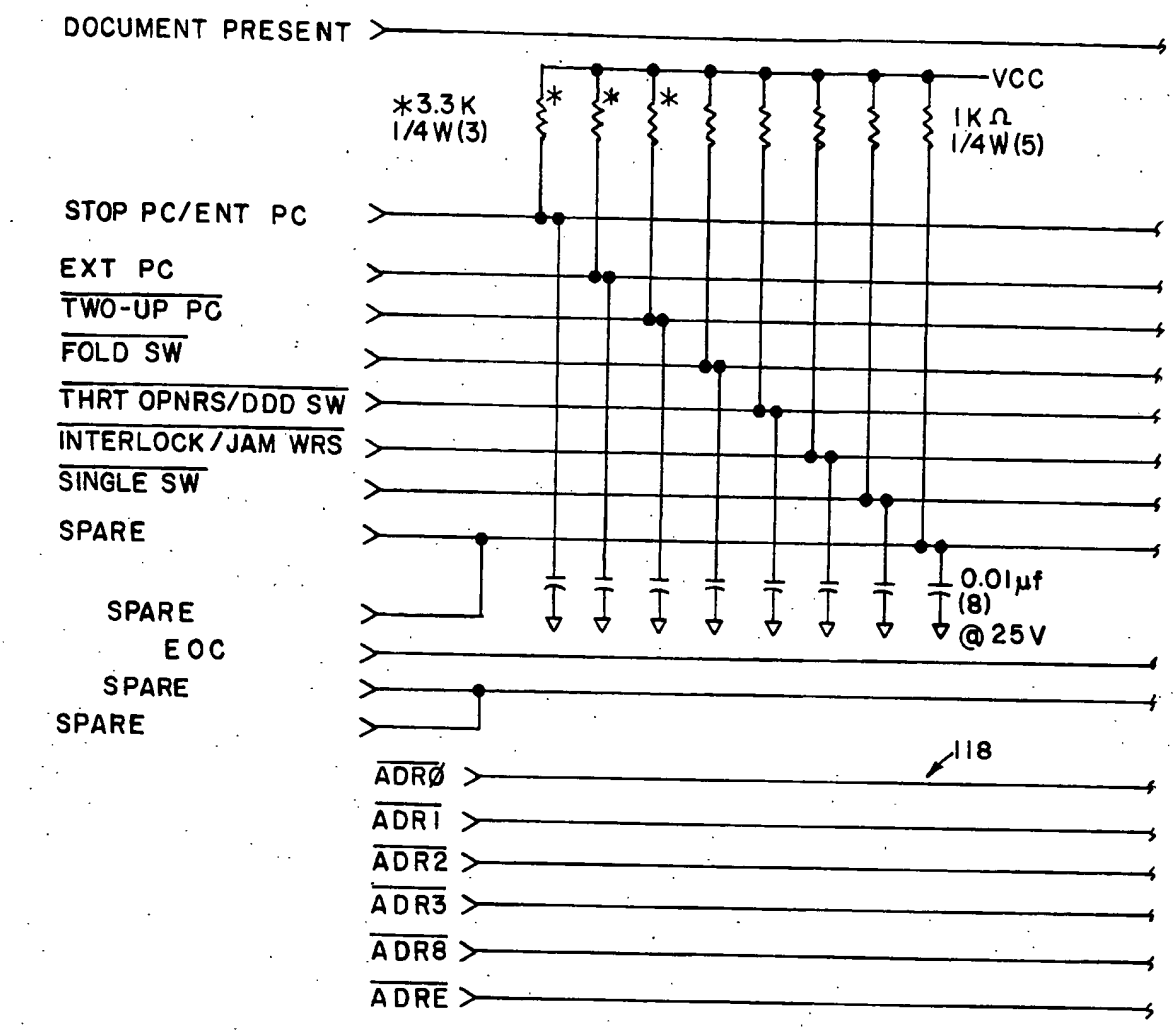
44
96
98
END MODULE
46
SIGNAL BUS
POWER BUS

FIG. 2b

FIG. 3


MAILING MACH. ZIP MARKER
STACKER
MOTOR CLUTCH BRAKE ENCODER
102
105
ACCESSORY INTERFACE CIRCUIT
TRANSPORT INTERFACE CIRCUIT
110A
FEEDER (ENV.) INTERFACE CIRCUIT
96
SUPERVISORY CONTROL CIRCUIT
100
SIGNAL BUS
160
110B
STD. H.R. H.S.F. F.F. B.F.
OPTIONAL
SCANNER INTERFACE CIRCUIT
FEEDER INTERFACE CIRCUIT
106
34
CENTRAL CONTROL DISPLAY



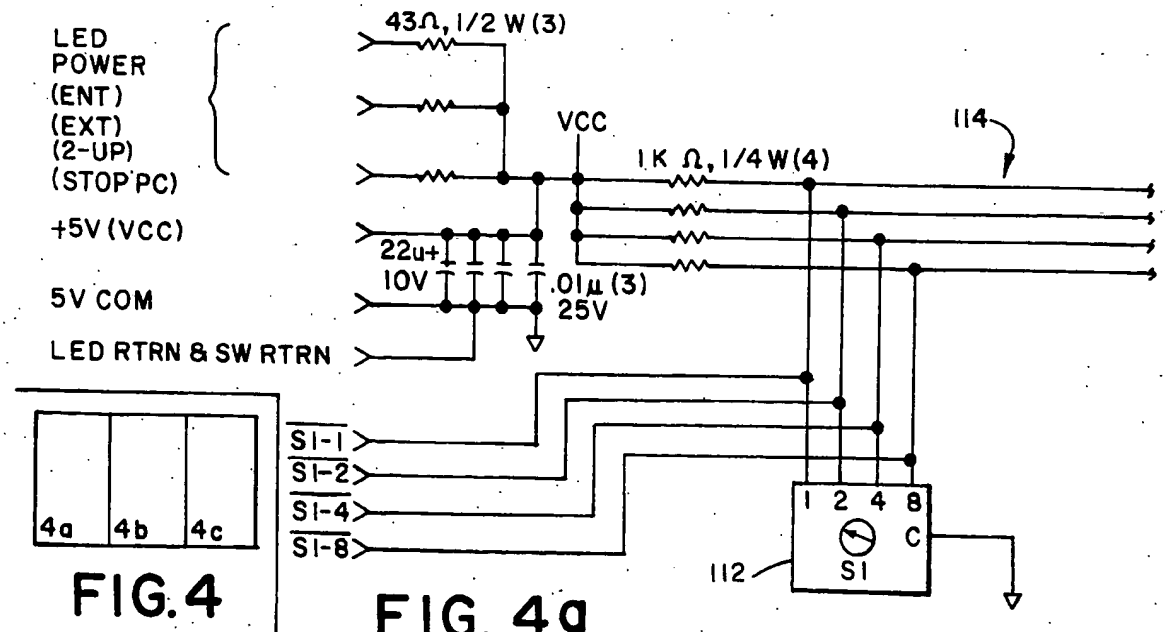
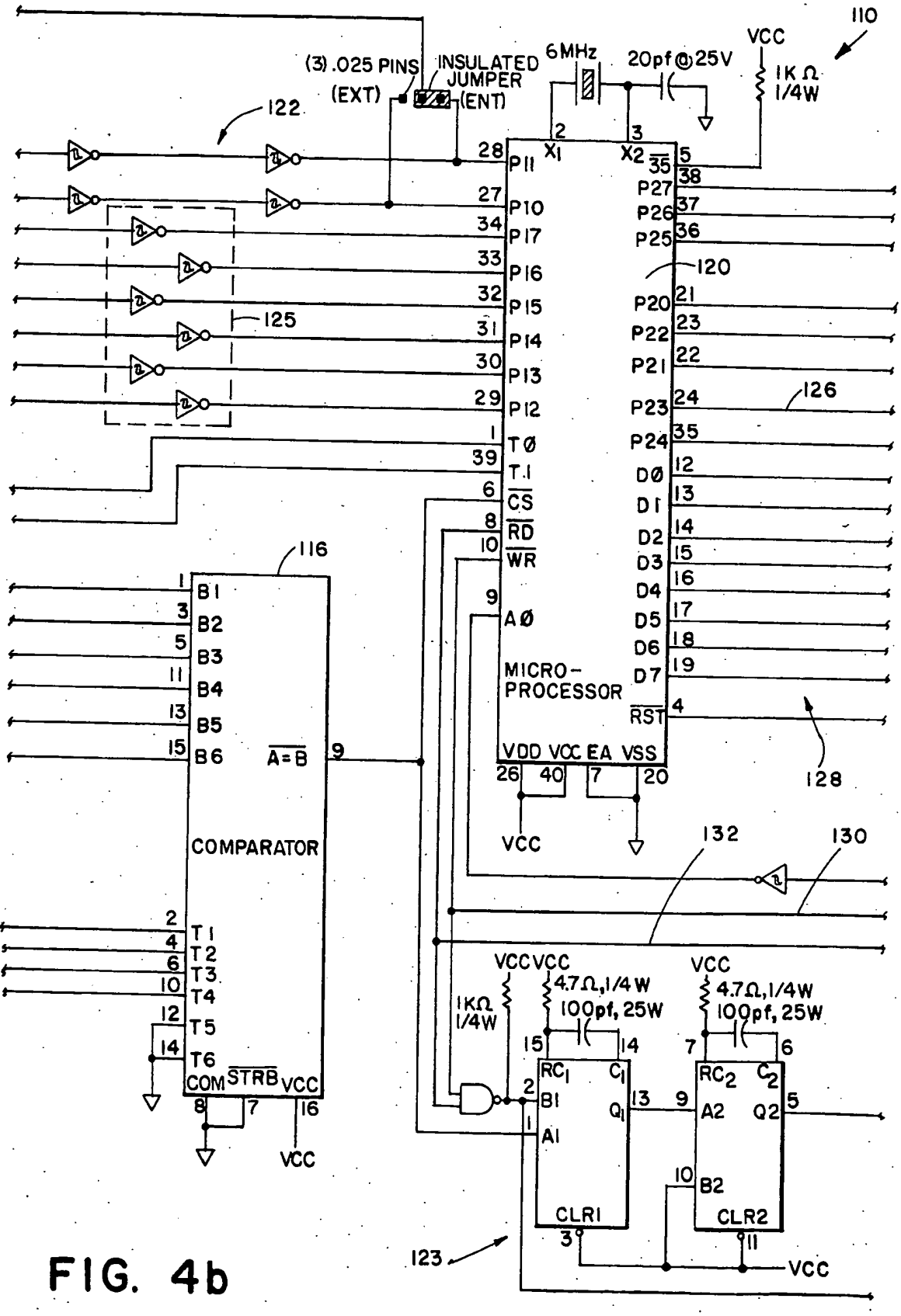


FIG. 4

FIG. 4a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VCC
1K Ω 1/4W
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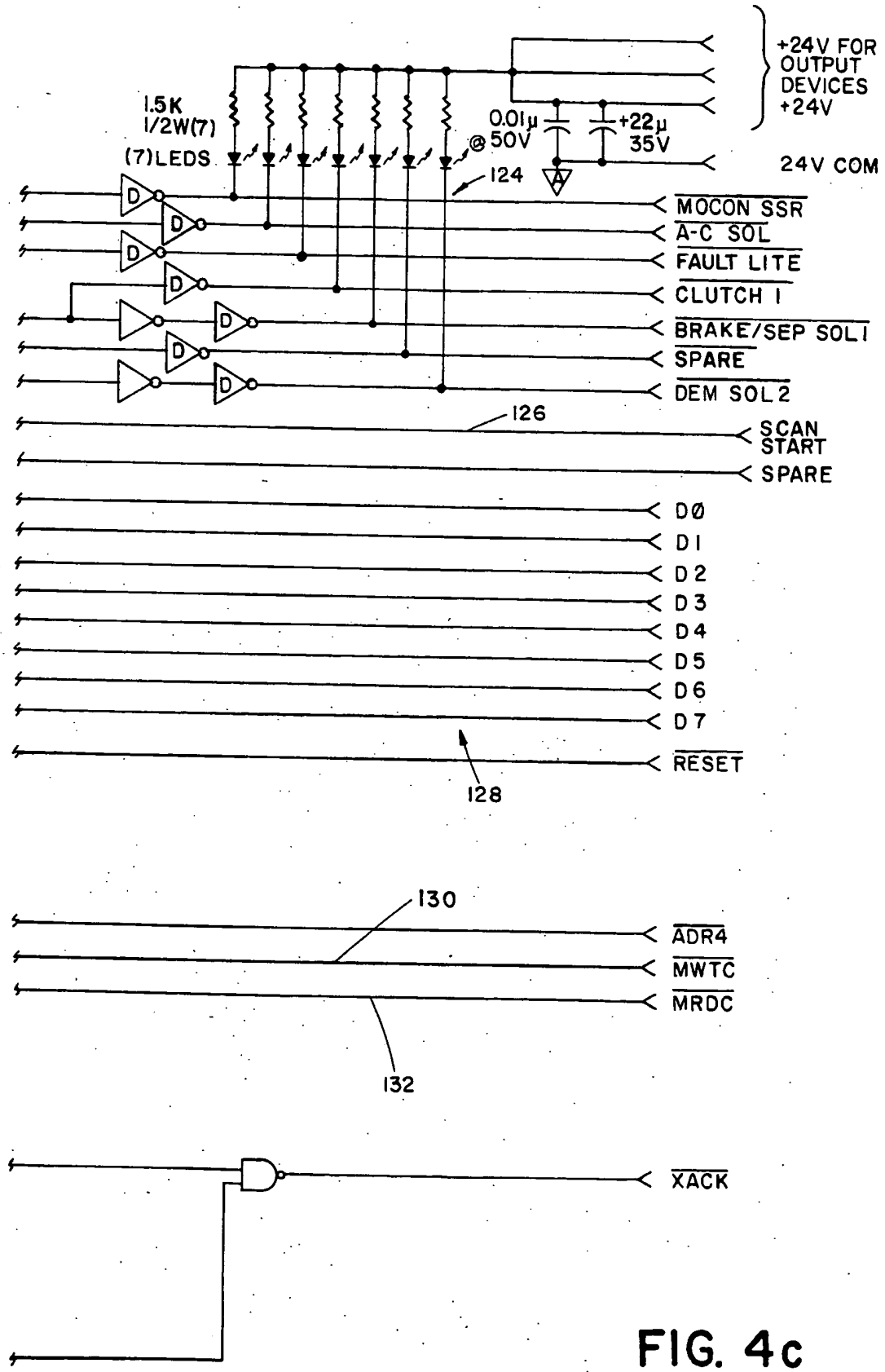
INSULATED JUMPER (ENT)
6MHz
20pf @ 25V
122
125
120
126
128
116
MICRO-PROCESSOR
COMPARATOR
A=B
COM STRB
VCC
VDD VCC EA VSS
RST
132
130
1KΩ 1/4W
4.7Ω, 1/4W
100pf, 25W
CLR1
CLR2
123

FIG. 4b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24V COM
1.5K 1/2W(7)
(7)LEDS
0.01μ @ 50V
+22μ 35V
124
MOCON SSR
A-C SOL
FAULT LITE
CLUTCH 1
BRAKE/SEP SOL1
SPARE
DEM SOL2
126
SCAN START
SPARE
D0
D1
D2
D3
D4
D5
D6
D7
RESET
128
130
ADR4
MWTC
MRDC
132
XACK

FIG. 4c

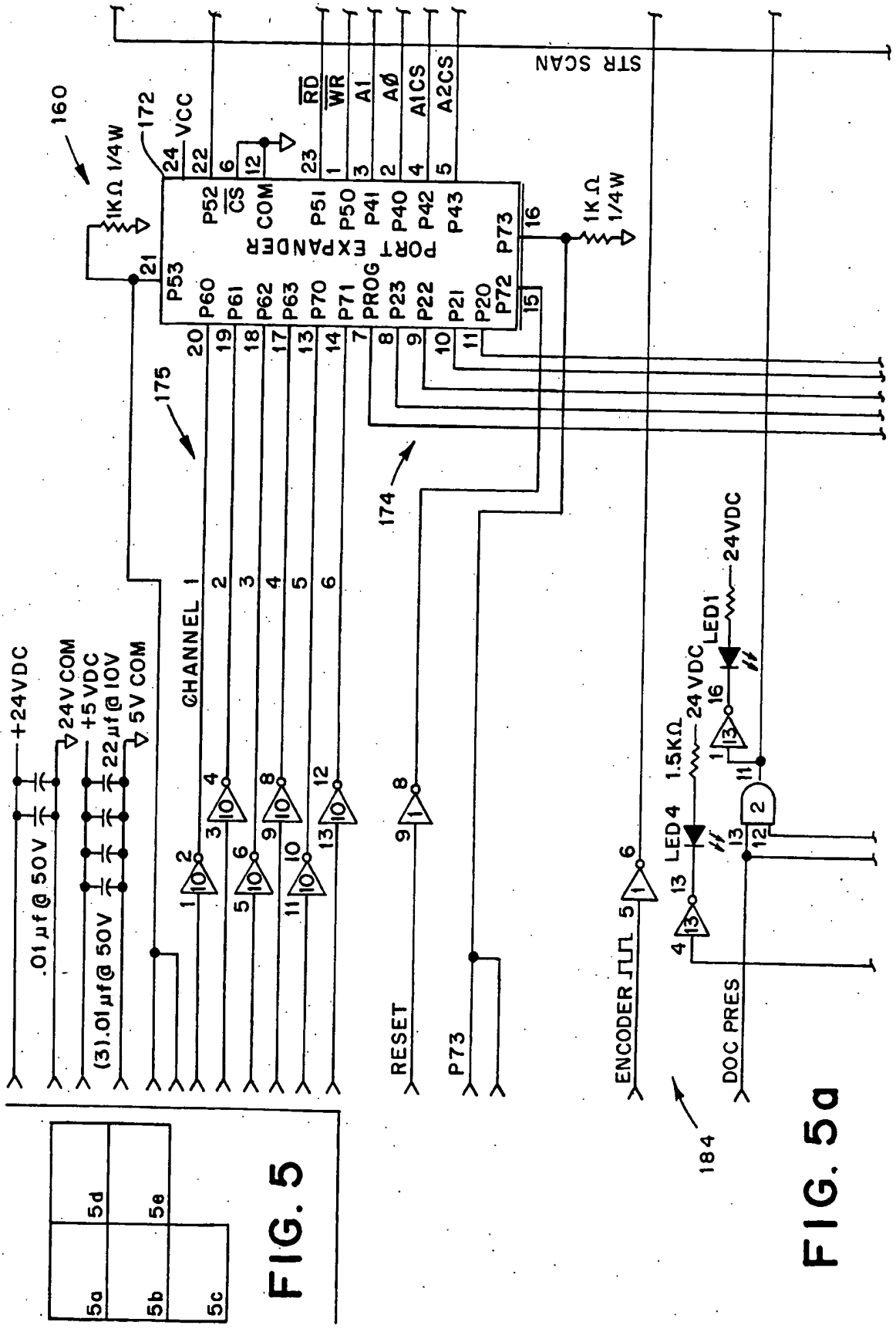

160
172
1KΩ 1/4W
24 VCC
22
6
12
23
1
3
2
4
5
RD
WR
A1
AØ
A1CS
A2CS
STR SCAN
P52
CS
COM
P51
P50
P41
P40
P42
P43
P73
16
1K Ω
1/4W
PORT EXPANDER
21
P53
P60
P61
P62
P63
P70
P71
PROG
P23
P22
P21
P20
P72
15
20
19
18
17
13
14
7
8
9
10
11
175
174
CHANNEL 1
2
3
4
5
6
+24VDC
24V COM
+5 VDC
22µf@10V
5V COM
.01µf@50V
(3).01µf@50V
4
8
12
2
6
10
RESET
P73
24VDC
LED1
16
24 VDC
1.5KΩ
LED4
13
11
12
ENCODER
DOC PRES
184

FIG. 5a

5d
5e
5a
5b
5c

FIG. 5

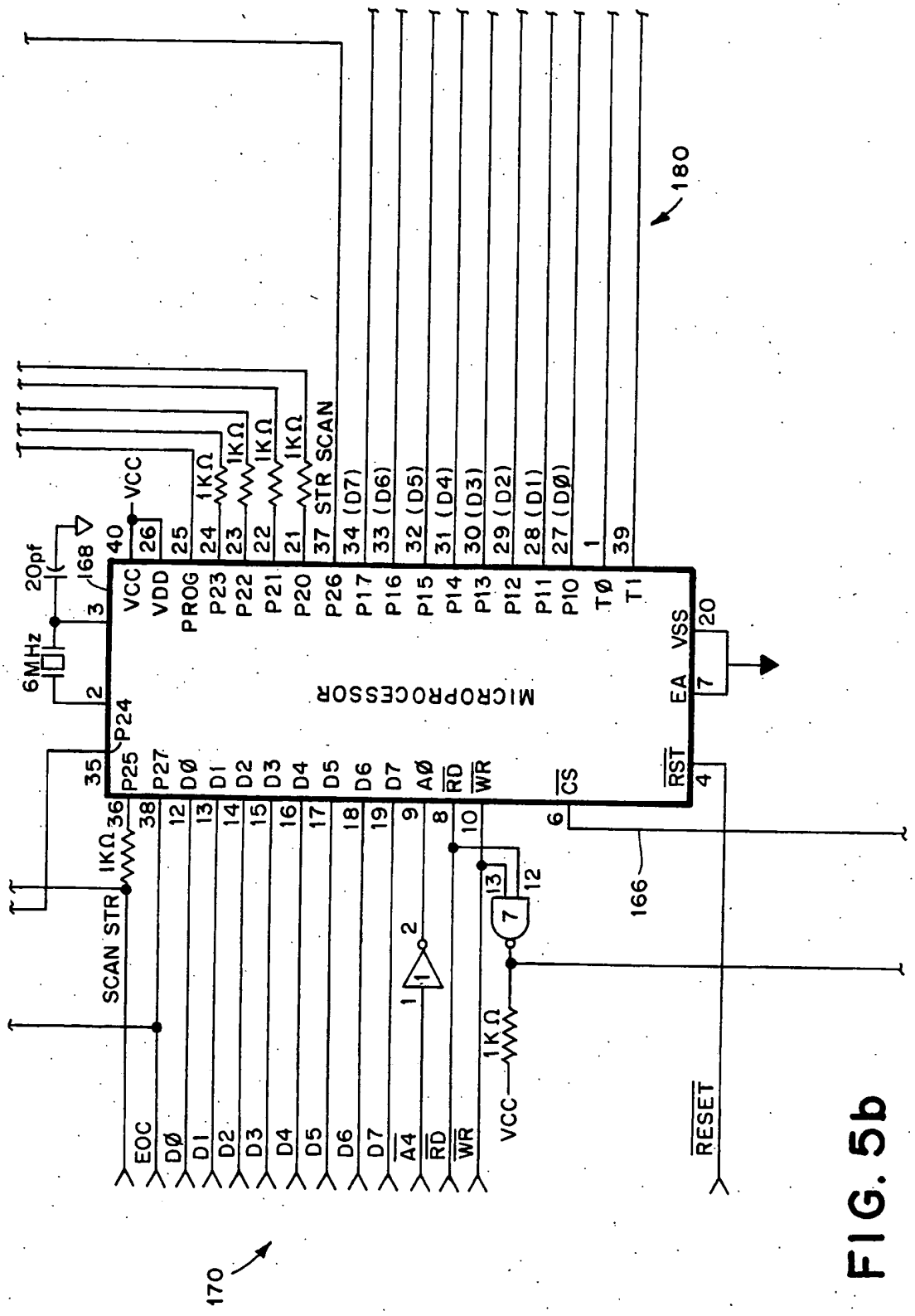

180
MICROPROCESSOR
VCC
VDD
PROG
P23
P22
P21
P20
P26
P17
P16
P15
P14
P13
P12
P11
P10
T0
T1
VSS
EA
RST
CS
WR
RD
A0
D7
D6
D5
D4
D3
D2
D1
D0
P27
P25
P24
1KΩ
STR SCAN
34 (D7)
33 (D6)
32 (D5)
31 (D4)
30 (D3)
29 (D2)
28 (D1)
27 (D0)
20pf
6MHz
SCAN STR
166
RESET
EOC
A4
170

FIG. 5b

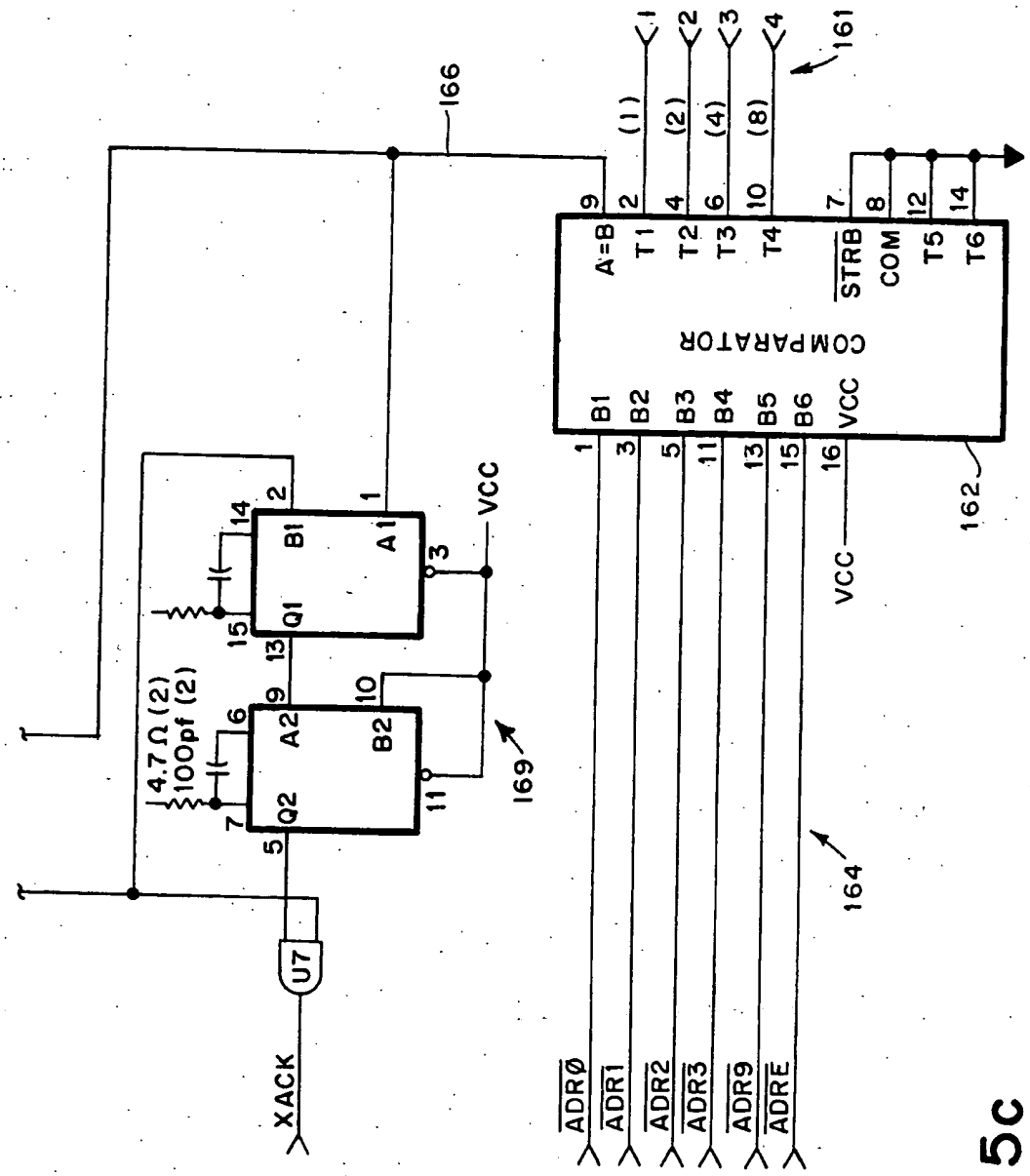

166
161
(1)
(2)
(4)
(8)
A=B
T1
T2
T3
T4
STRB
COM
T5
T6
COMPARATOR
B1
B2
B3
B4
B5
B6
VCC
162
VCC
VCC
A1
B1
Q1
A2
B2
Q2
4.7Ω (2)
100pf (2)
169
164
U7
XACK
ADRØ
ADR1
ADR2
ADR3
ADR9
ADRE

FIG. 5c

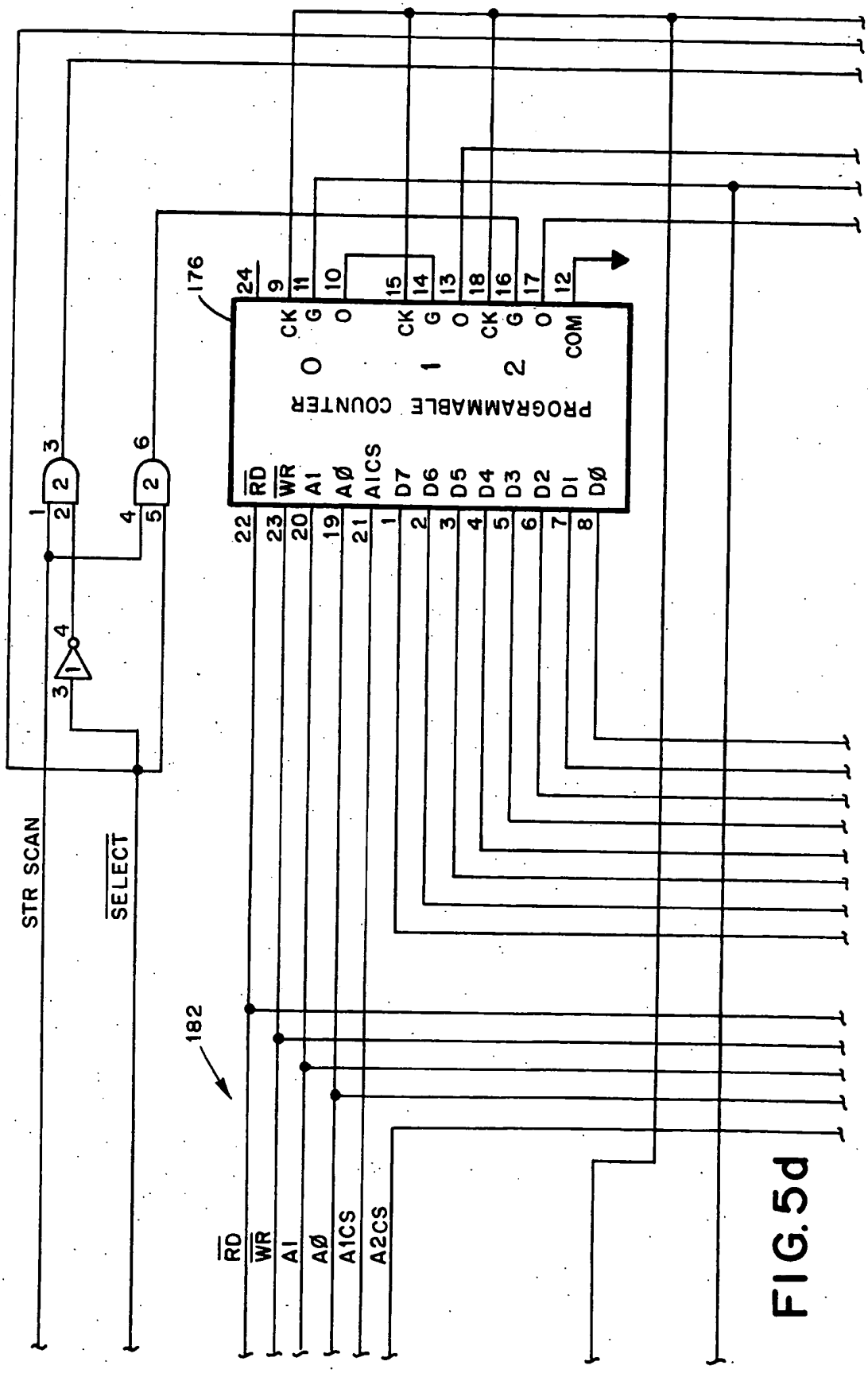

176
PROGRAMMABLE COUNTER
CK G O CK G O CK G O COM
0 1 2
RD WR A1 AØ A1CS D7 D6 D5 D4 D3 D2 D1 DØ
STR SCAN
SELECT
182
RD WR A1 AØ A1CS A2CS

FIG.5d

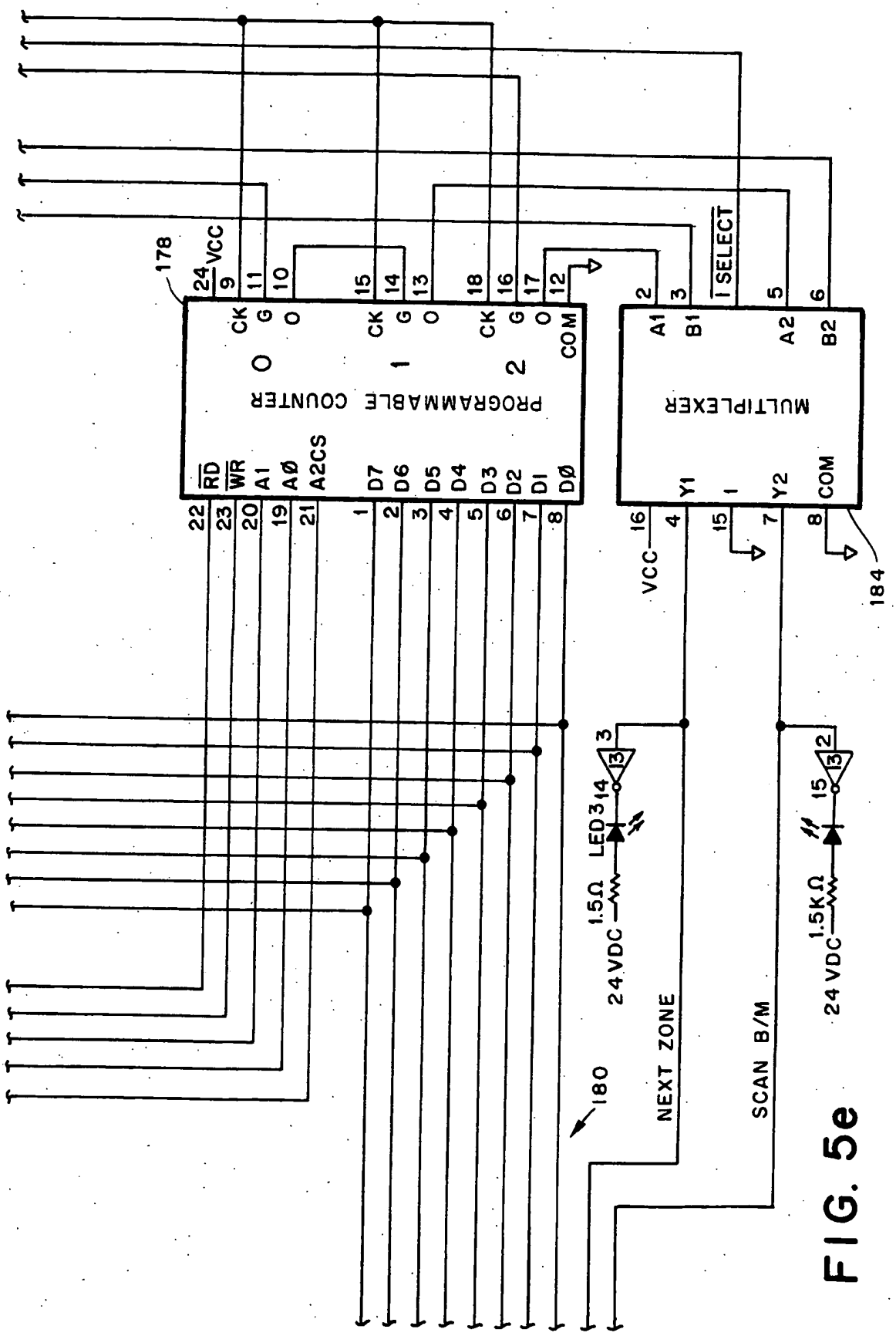

178
24 VCC
9
11
10
15
14
13
18
16
17
12
CK G O
CK G O
CK G O
COM
0
1
2
PROGRAMMABLE COUNTER
RD WR A1 AØ A2CS
D7 D6 D5 D4 D3 D2 D1 DØ
22 23 20 19 21
1 2 3 4 5 6 7 8
2
3
5
6
A1 B1 A2 B2
SELECT
MULTIPLEXER
Y1 1 Y2 COM
16 4 15 7 8
VCC
184
LED 3
14
1.5Ω
24 VDC
180
NEXT ZONE
SCAN B/M
1.5KΩ
24 VDC

FIG. 5e

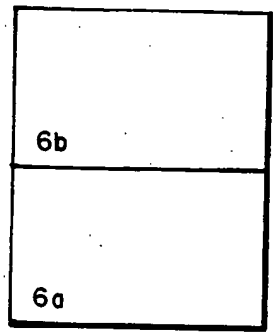


FIG. 6

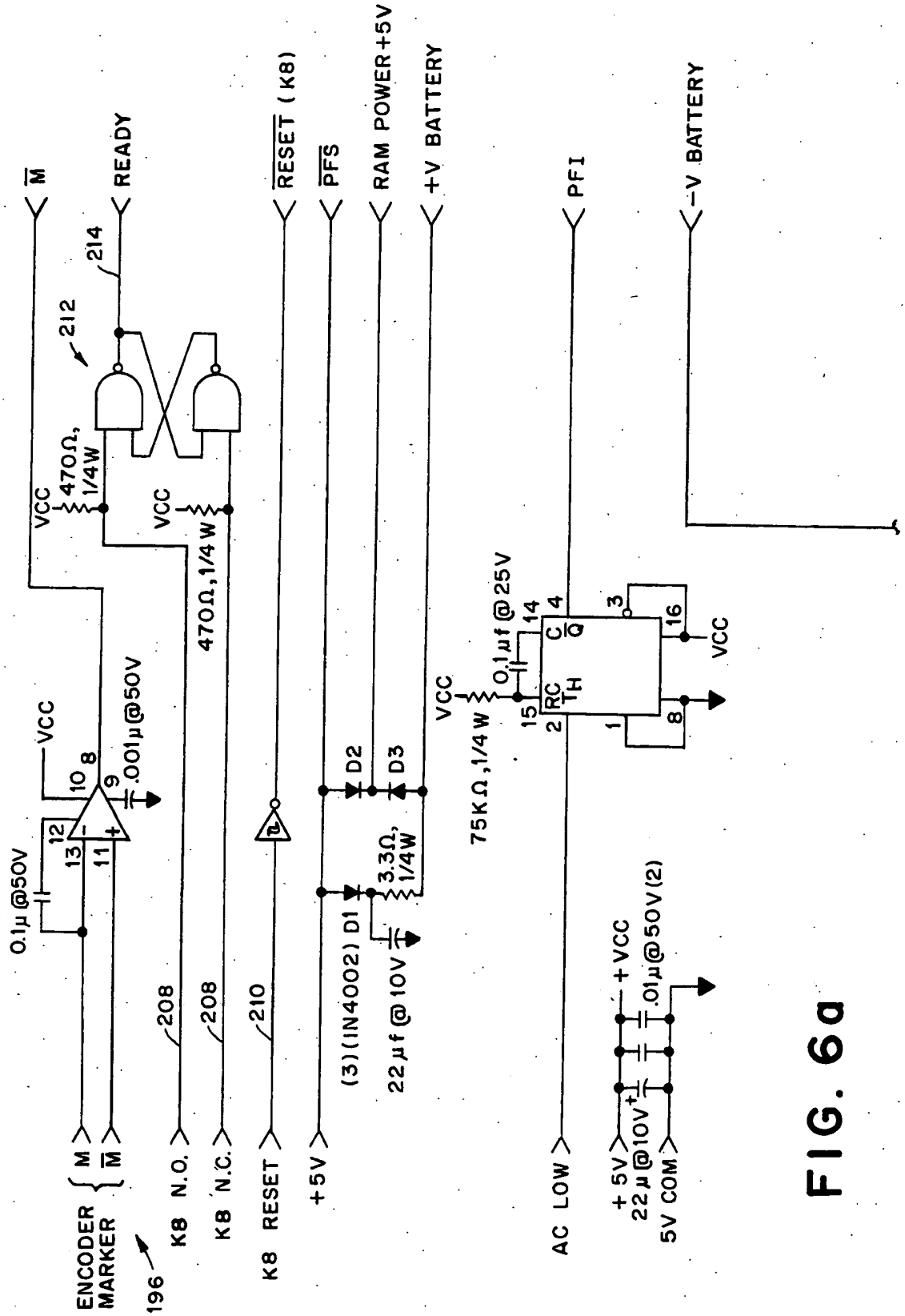

M
READY
RESET (K8)
PFS
RAM POWER +5V
+V BATTERY
PFI
-V BATTERY
214
212
470Ω, 1/4W
VCC
470Ω, 1/4 W
0.1µ@50V
.001µ@50V
D2
D3
3.3Ω, 1/4W
(3)(IN4002) D1
22µf @10V
75KΩ, 1/4 W
0.1µf @25V
+VCC
.01µ@50V(2)
22µ@10V
ENCODER MARKER
196
K8 N.O.
K8 N.C.
K8 RESET
+5V
AC LOW
+5V
5V COM
208
208
210

FIG. 6a

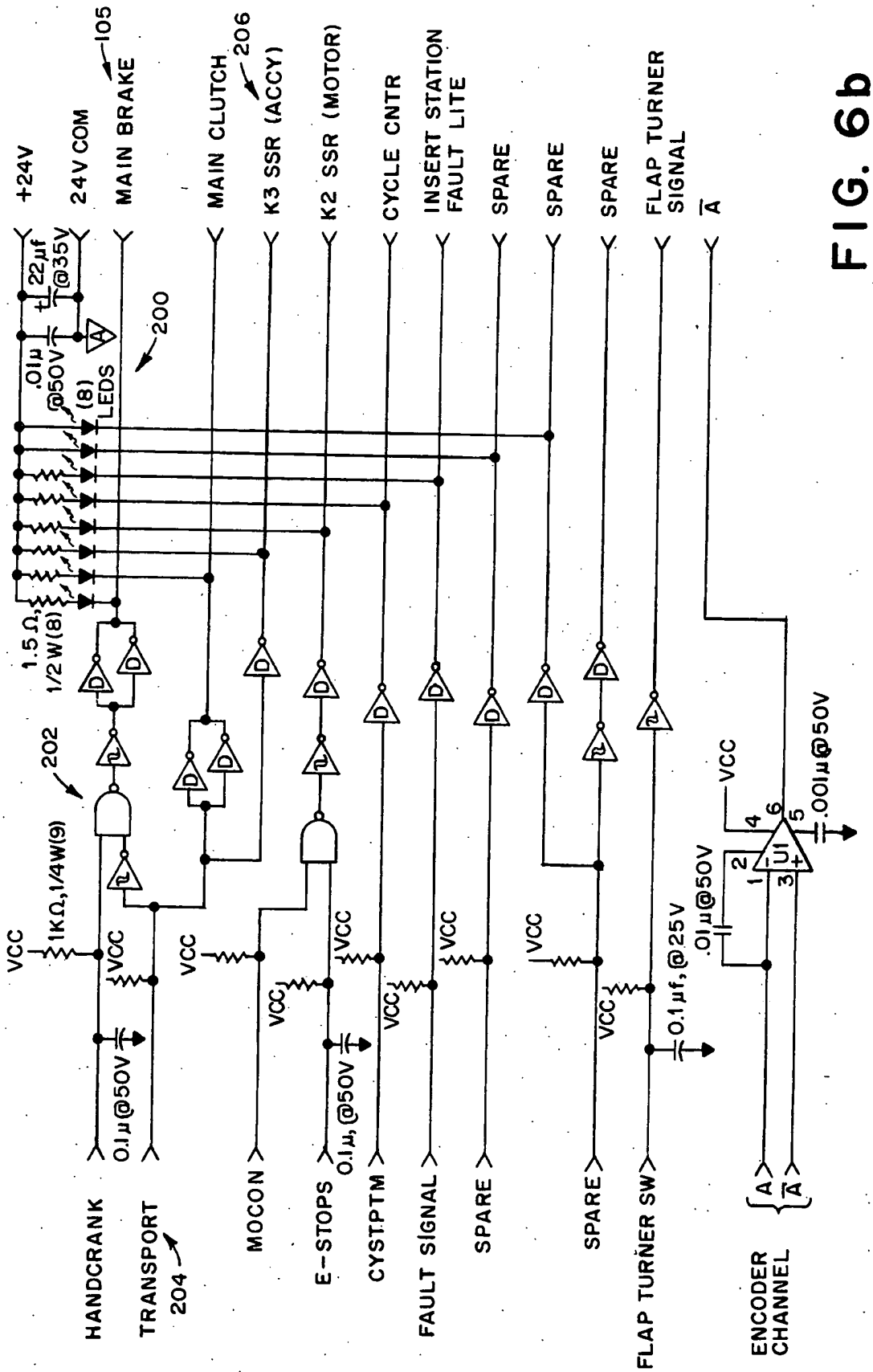

+24V
24V COM
MAIN BRAKE
105
MAIN CLUTCH
206
K3 SSR (ACCY)
K2 SSR (MOTOR)
CYCLE CNTR
INSERT STATION FAULT LITE
SPARE
SPARE
SPARE
FLAP TURNER SIGNAL
Ā
22µf @35V
.01µ @50V
(8) LEDS
200
1.5Ω, 1/2 W(8)
202
1KΩ, 1/4W(9)
VCC
0.1µ@50V
HANDCRANK
TRANSPORT
204
MOCON
0.1µ, @50V
E-STOPS
CYSTPTM
FAULT SIGNAL
SPARE
SPARE
FLAP TURNER SW
0.1µf, @25V
.01µ@50V
U1
.001µ@50V
A
Ā
ENCODER CHANNEL

FIG. 6b

Fig. 7A.

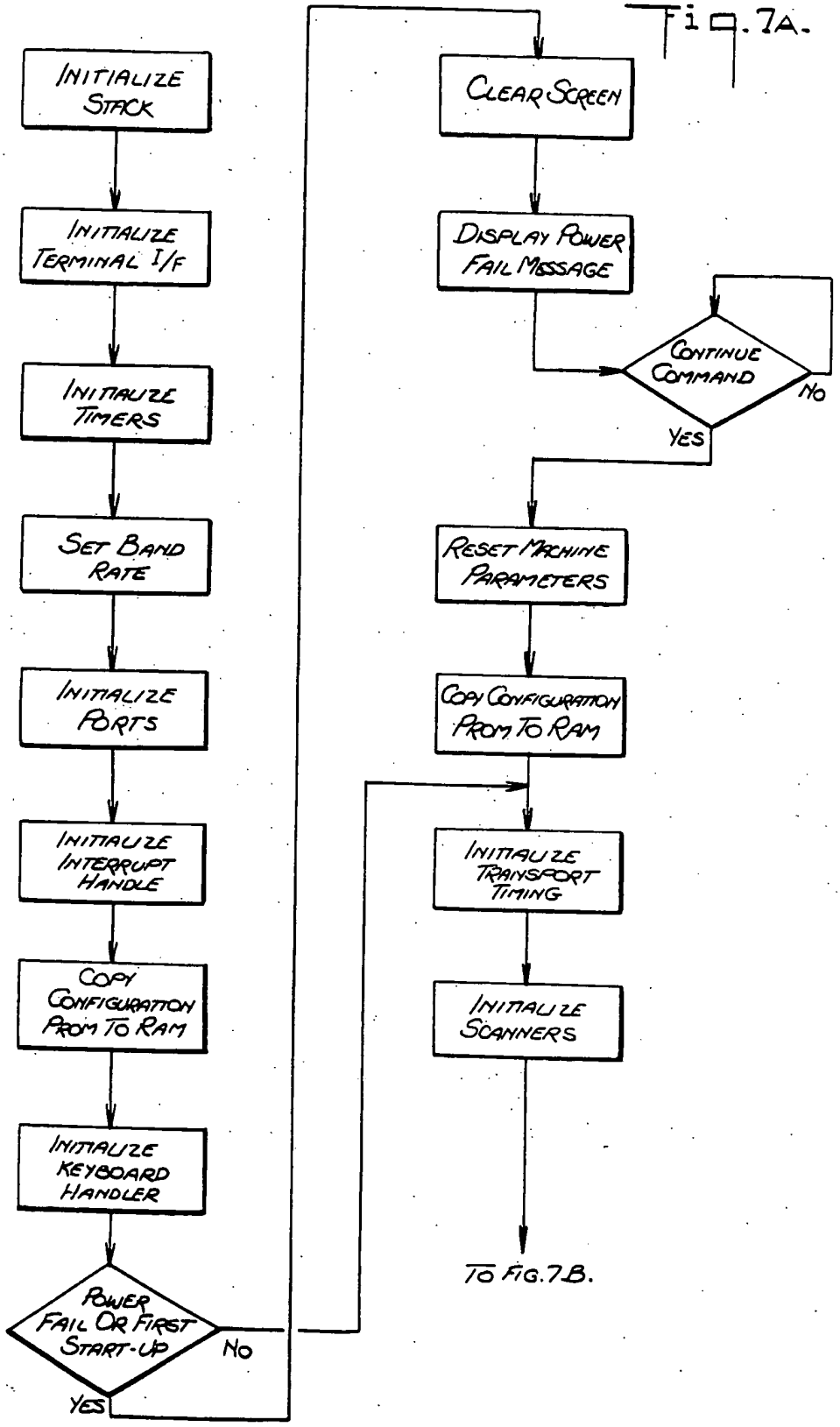
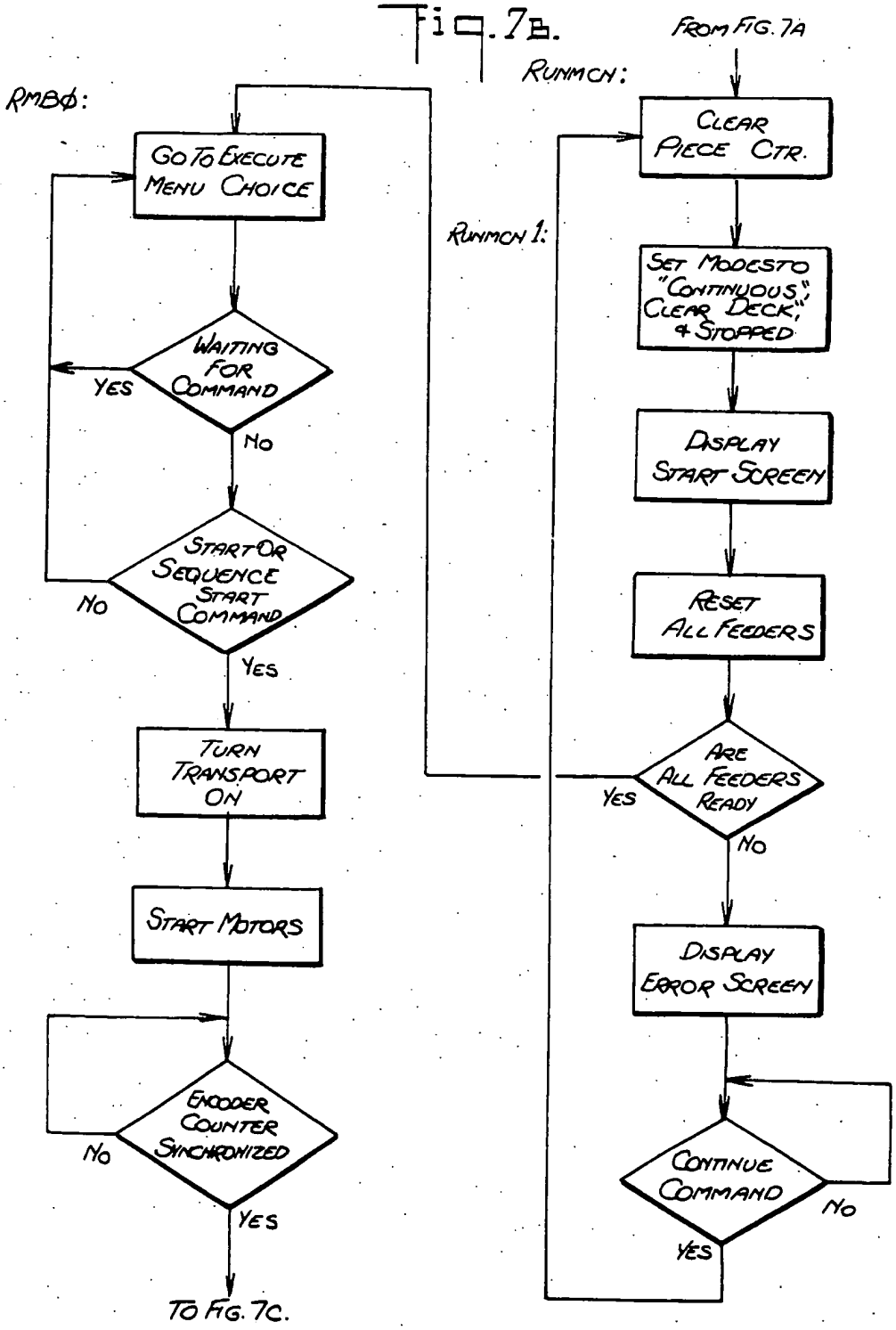

INITIALIZE STACK
INITIALIZE TERMINAL I/F
INITIALIZE TIMERS
SET BAND RATE
INITIALIZE PORTS
INITIALIZE INTERRUPT HANDLE
COPY CONFIGURATION PROM TO RAM
INITIALIZE KEYBOARD HANDLER
POWER FAIL OR FIRST START-UP
NO
YES
CLEAR SCREEN
DISPLAY POWER FAIL MESSAGE
CONTINUE COMMAND
NO
YES
RESET MACHINE PARAMETERS
COPY CONFIGURATION PROM TO RAM
INITIALIZE TRANSPORT TIMING
INITIALIZE SCANNERS
TO FIG. 7B.

Fig. 7B.


FROM FIG. 7A
RUNMCN:
CLEAR PIECE CTR.
RUNMCN 1:
SET MODESTO "CONTINUOUS", CLEAR DECK, & STOPPED
DISPLAY START SCREEN
RESET ALL FEEDERS
ARE ALL FEEDERS READY
YES
NO
DISPLAY ERROR SCREEN
CONTINUE COMMAND
NO
YES
RMBØ:
GO TO EXECUTE MENU CHOICE
WAITING FOR COMMAND
YES
NO
START OR SEQUENCE START COMMAND
NO
YES
TURN TRANSPORT ON
START MOTORS
ENCODER COUNTER SYNCHRONIZED
NO
YES
TO FIG. 7C.

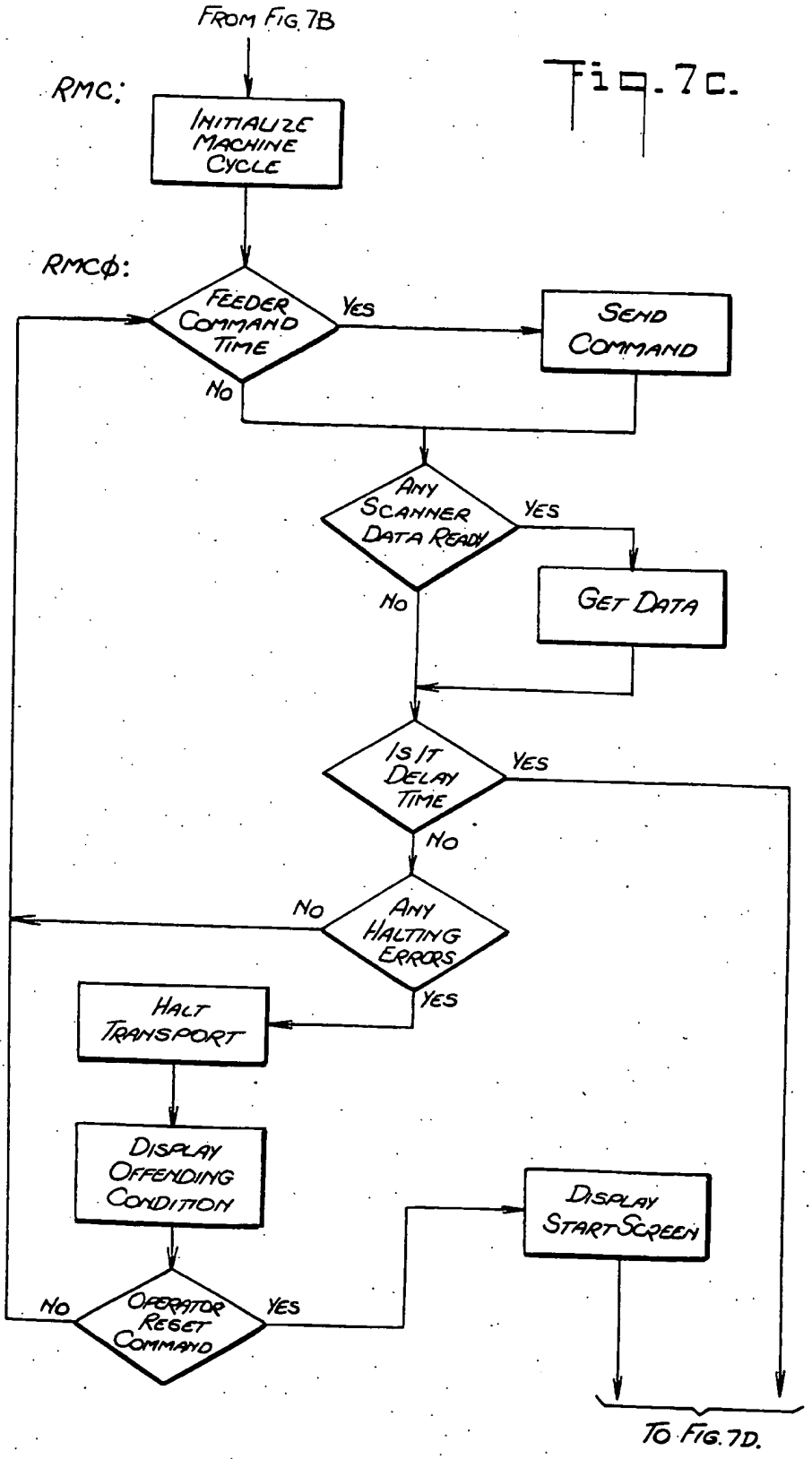

FROM FIG. 7B
RMC:
INITIALIZE MACHINE CYCLE
RMCϕ:
FEEDER COMMAND TIME
YES
SEND COMMAND
NO
ANY SCANNER DATA READY
YES
NO
GET DATA
IS IT DELAY TIME
YES
NO
ANY HALTING ERRORS
NO
YES
HALT TRANSPORT
DISPLAY OFFENDING CONDITION
DISPLAY START SCREEN
OPERATOR REGET COMMAND
NO
YES
TO FIG. 7D.

Fig. 7C.

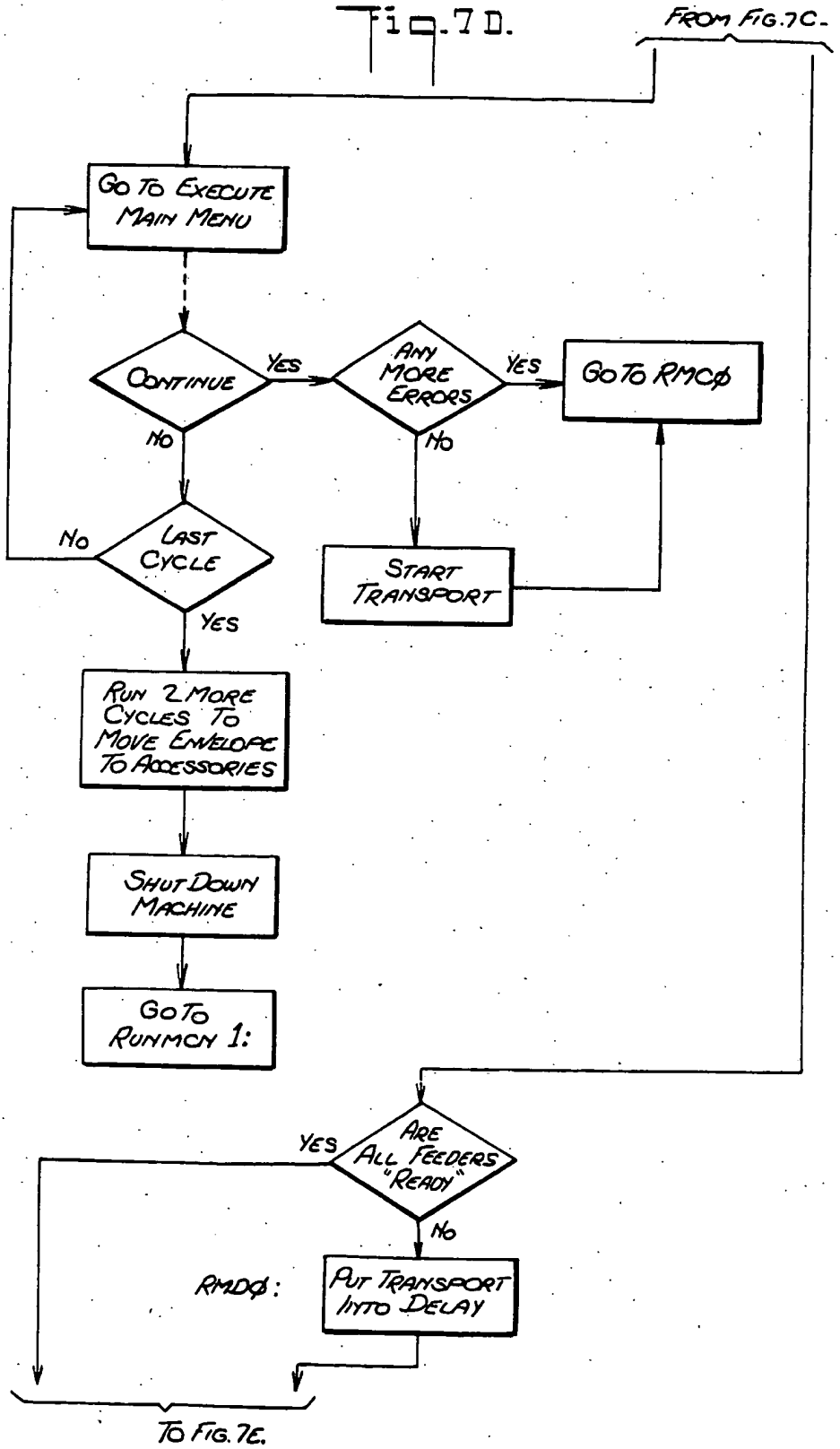
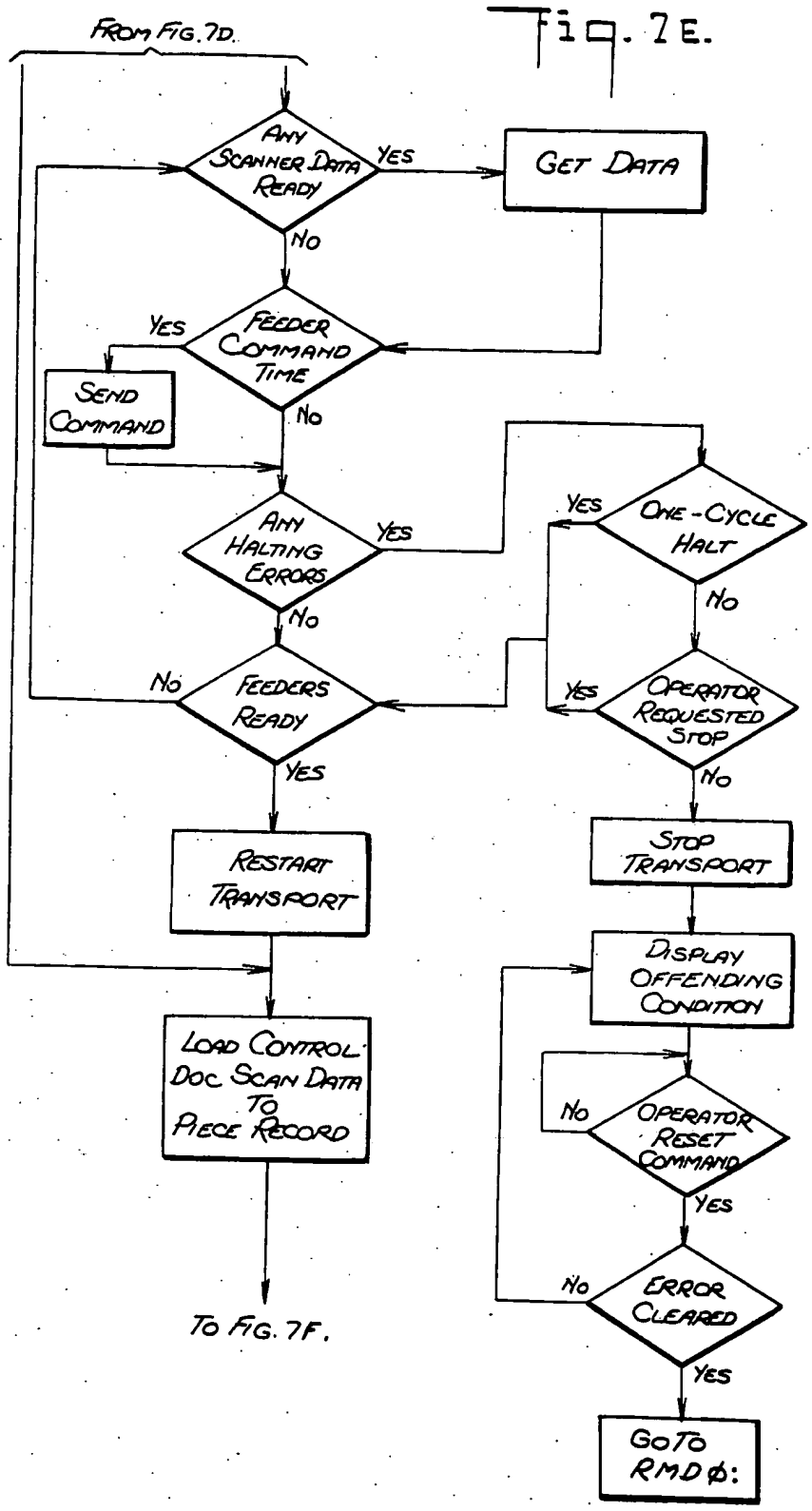


Fig. 7D.
FROM FIG. 7C.
GO TO EXECUTE MAIN MENU
CONTINUE
YES
ANY MORE ERRORS
YES
GO TO RMCØ
NO
NO
NO
LAST CYCLE
START TRANSPORT
YES
RUN 2 MORE CYCLES TO MOVE ENVELOPE TO ACCESSORIES
SHUT DOWN MACHINE
GO TO RUNMCN 1:
YES
ARE ALL FEEDERS "READY"
NO
RMDØ:
PUT TRANSPORT INTO DELAY
TO FIG. 7E.

Fig. 7E.


FROM FIG. 7D.
ANY SCANNER DATA READY
YES
GET DATA
NO
FEEDER COMMAND TIME
YES
SEND COMMAND
NO
ANY HALTING ERRORS
YES
NO
FEEDERS READY
NO
YES
ONE-CYCLE HALT
YES
NO
OPERATOR REQUESTED STOP
YES
NO
STOP TRANSPORT
DISPLAY OFFENDING CONDITION
OPERATOR RESET COMMAND
NO
YES
ERROR CLEARED
NO
YES
GOTO RMD ϕ:
RESTART TRANSPORT
LOAD CONTROL DOC SCAN DATA TO PIECE RECORD
TO FIG. 7F.

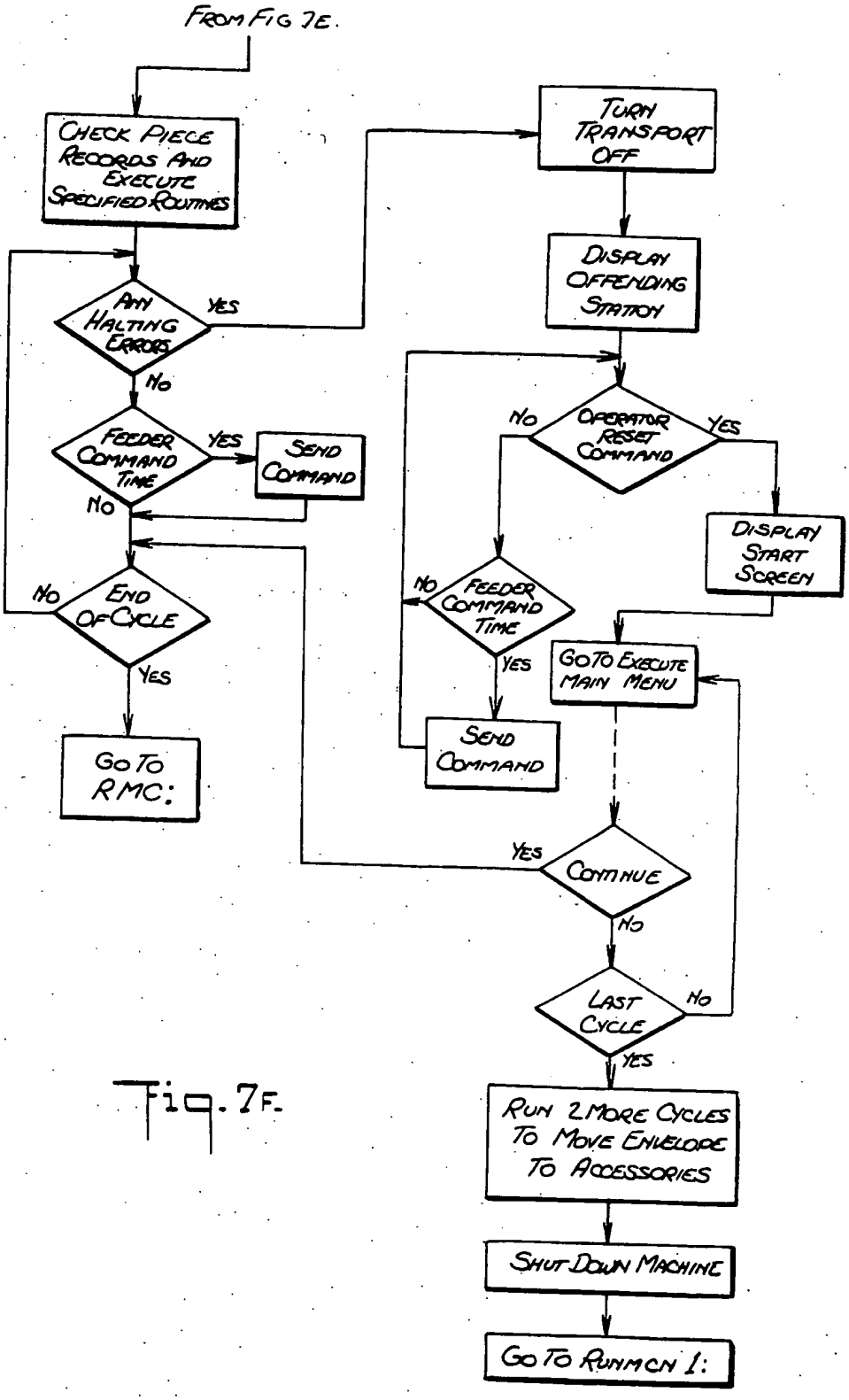
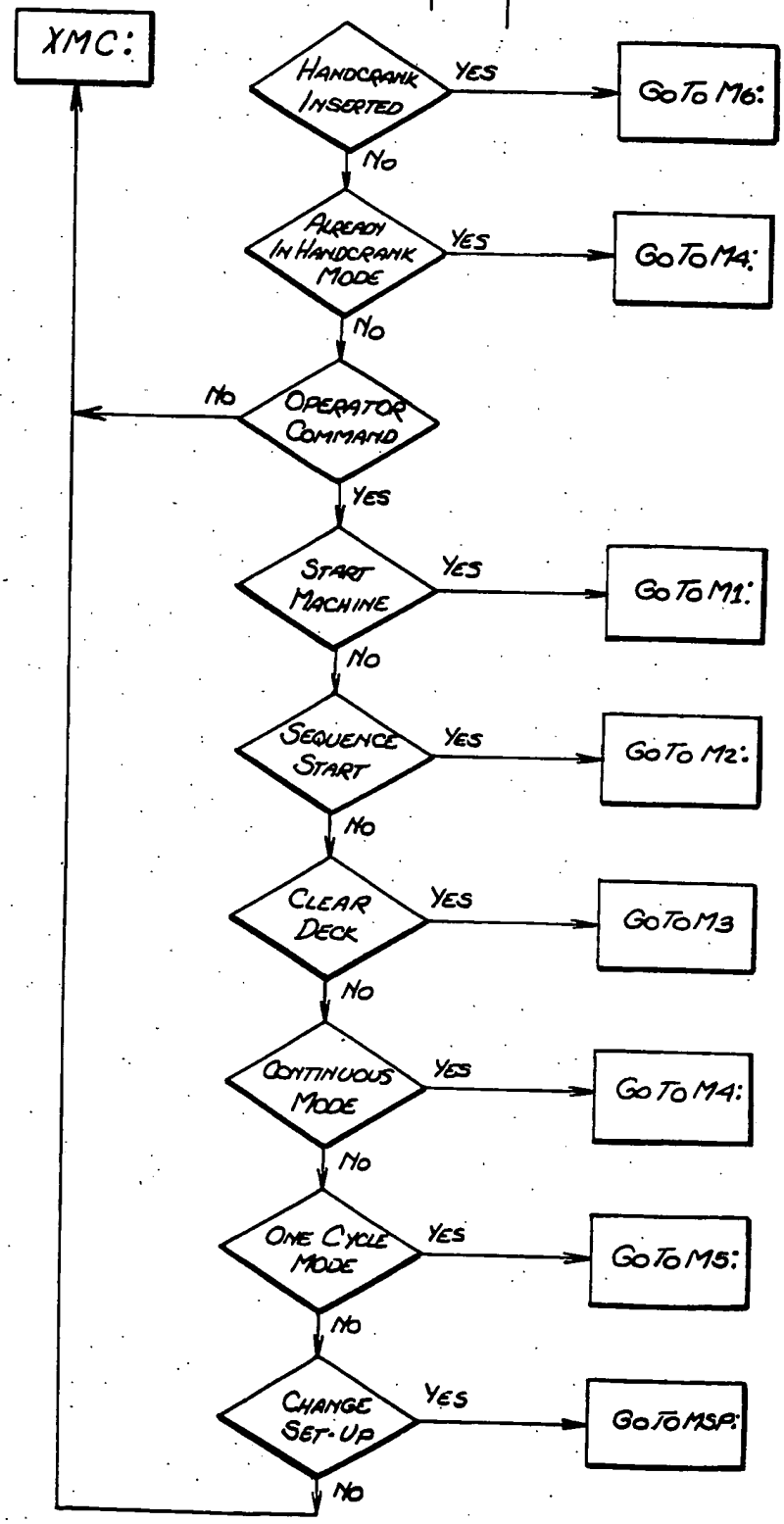

FROM FIG 7E.
CHECK PIECE RECORDS AND EXECUTE SPECIFIED ROUTINES
ANY HALTING ERRORS
YES
NO
TURN TRANSPORT OFF
DISPLAY OFFENDING STATION
FEEDER COMMAND TIME
YES
SEND COMMAND
NO
OPERATOR RESET COMMAND
NO
YES
DISPLAY START SCREEN
END OF CYCLE
NO
YES
FEEDER COMMAND TIME
NO
YES
GO TO EXECUTE MAIN MENU
SEND COMMAND
GO TO RMC:
CONTINUE
YES
NO
LAST CYCLE
NO
YES
RUN 2 MORE CYCLES TO MOVE ENVELOPE TO ACCESSORIES
SHUT DOWN MACHINE
GO TO RUNMCN 1:

Fig. 7F.

Fig. 7G.


XMC:
HANDCRANK INSERTED
YES
GO TO M6:
NO
ALREADY IN HANDCRANK MODE
YES
GO TO M4:
NO
OPERATOR COMMAND
NO
YES
START MACHINE
YES
GO TO M1:
NO
SEQUENCE START
YES
GO TO M2:
NO
CLEAR DECK
YES
GO TO M3
NO
CONTINUOUS MODE
YES
GO TO M4:
NO
ONE CYCLE MODE
YES
GO TO M5:
NO
CHANGE SET-UP
YES
GO TO MSP:
NO

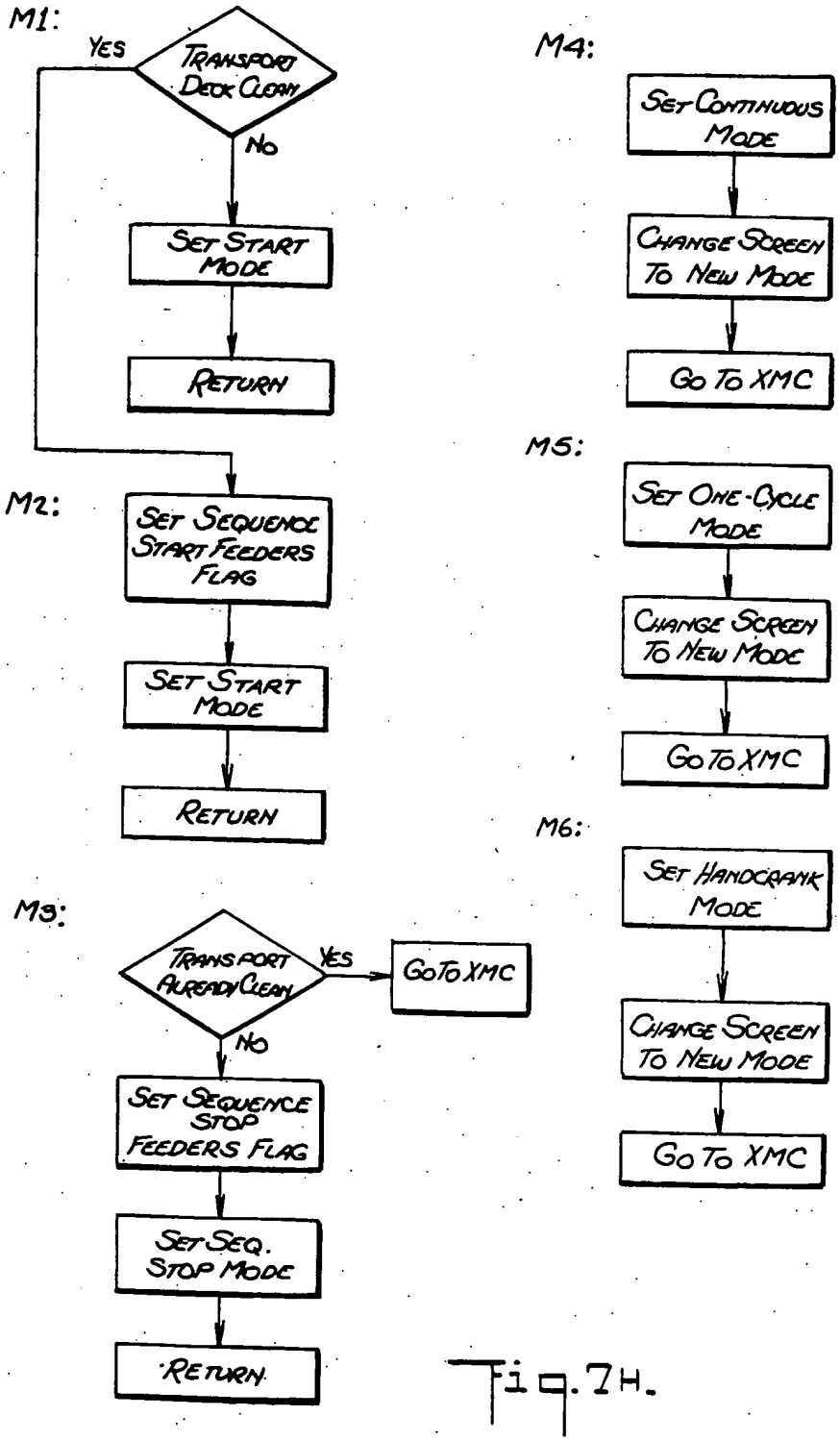

M1:
YES
TRANSPORT DECK CLEAN
NO
SET START MODE
RETURN
M2:
SET SEQUENCE START FEEDERS FLAG
SET START MODE
RETURN
M3:
TRANSPORT ALREADY CLEAN
YES
GO TO XMC
NO
SET SEQUENCE STOP FEEDERS FLAG
SET SEQ. STOP MODE
RETURN
M4:
SET CONTINUOUS MODE
CHANGE SCREEN TO NEW MODE
GO TO XMC
M5:
SET ONE-CYCLE MODE
CHANGE SCREEN TO NEW MODE
GO TO XMC
M6:
SET HANDCRANK MODE
CHANGE SCREEN TO NEW MODE
GO TO XMC

Fig. 7H.

Fig. 7J.

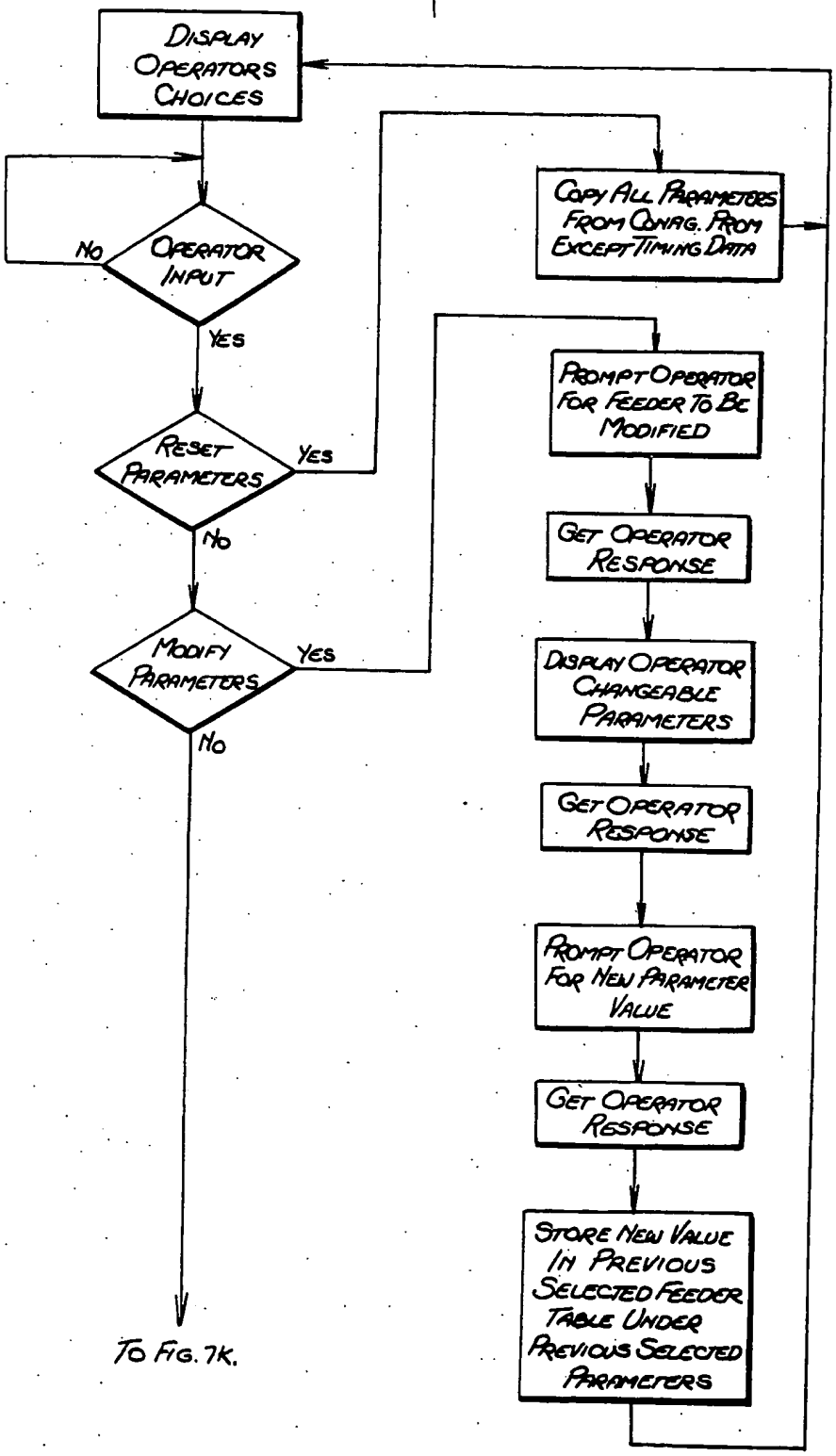
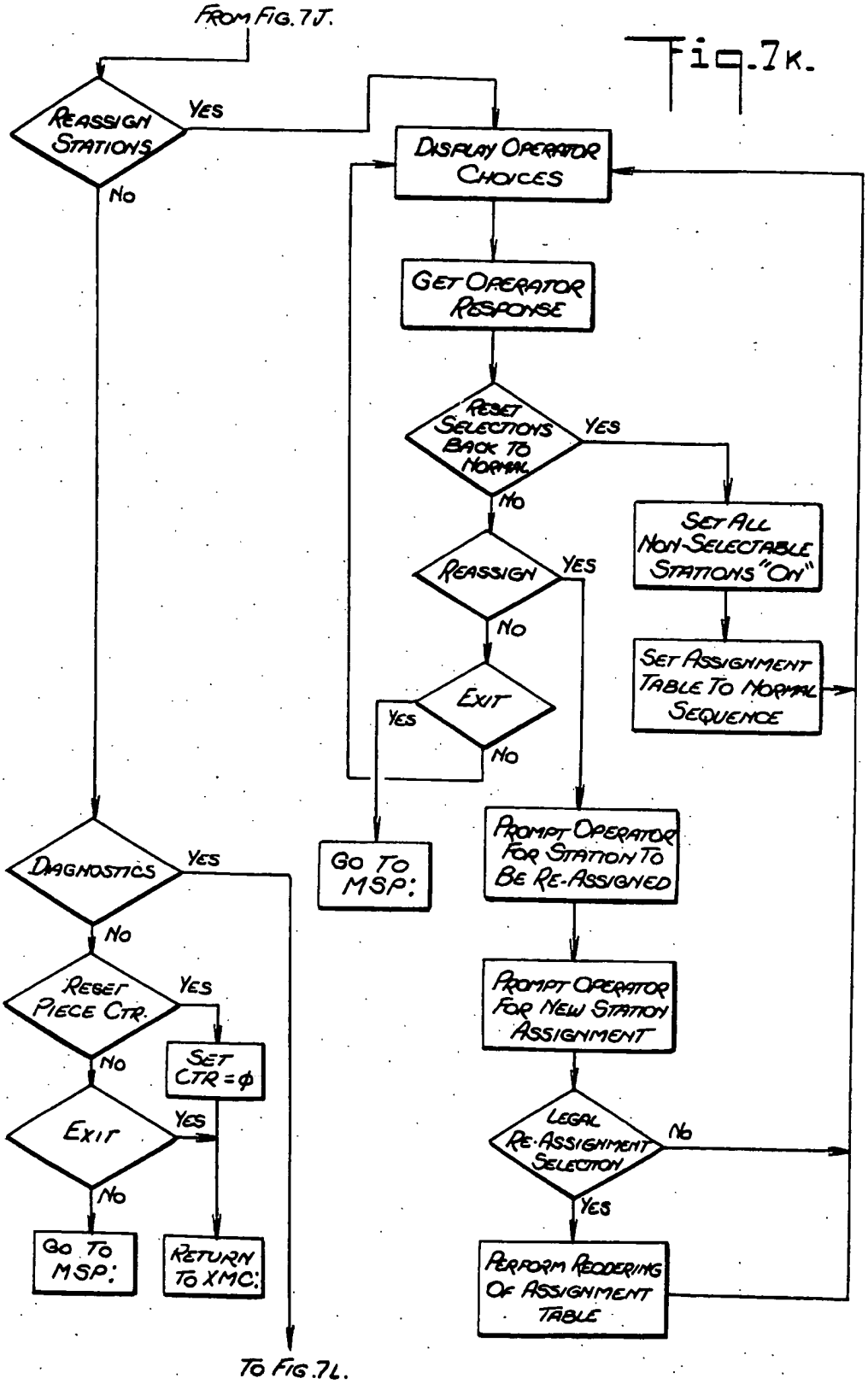


Fig. 7K.


FROM FIG. 7J.
REASSIGN STATIONS
YES
NO
DISPLAY OPERATOR CHOICES
GET OPERATOR RESPONSE
RESET SELECTIONS BACK TO NORMAL
YES
NO
SET ALL NON-SELECTABLE STATIONS "ON"
REASSIGN
YES
NO
SET ASSIGNMENT TABLE TO NORMAL SEQUENCE
EXIT
YES
NO
GO TO MSP:
PROMPT OPERATOR FOR STATION TO BE RE-ASSIGNED
PROMPT OPERATOR FOR NEW STATION ASSIGNMENT
LEGAL RE-ASSIGNMENT SELECTION
NO
YES
PERFORM REORDERING OF ASSIGNMENT TABLE
DIAGNOSTICS
YES
NO
RESET PIECE CTR.
YES
NO
SET CTR = ϕ
EXIT
YES
NO
GO TO MSP:
RETURN TO XMC:
TO FIG. 7L.

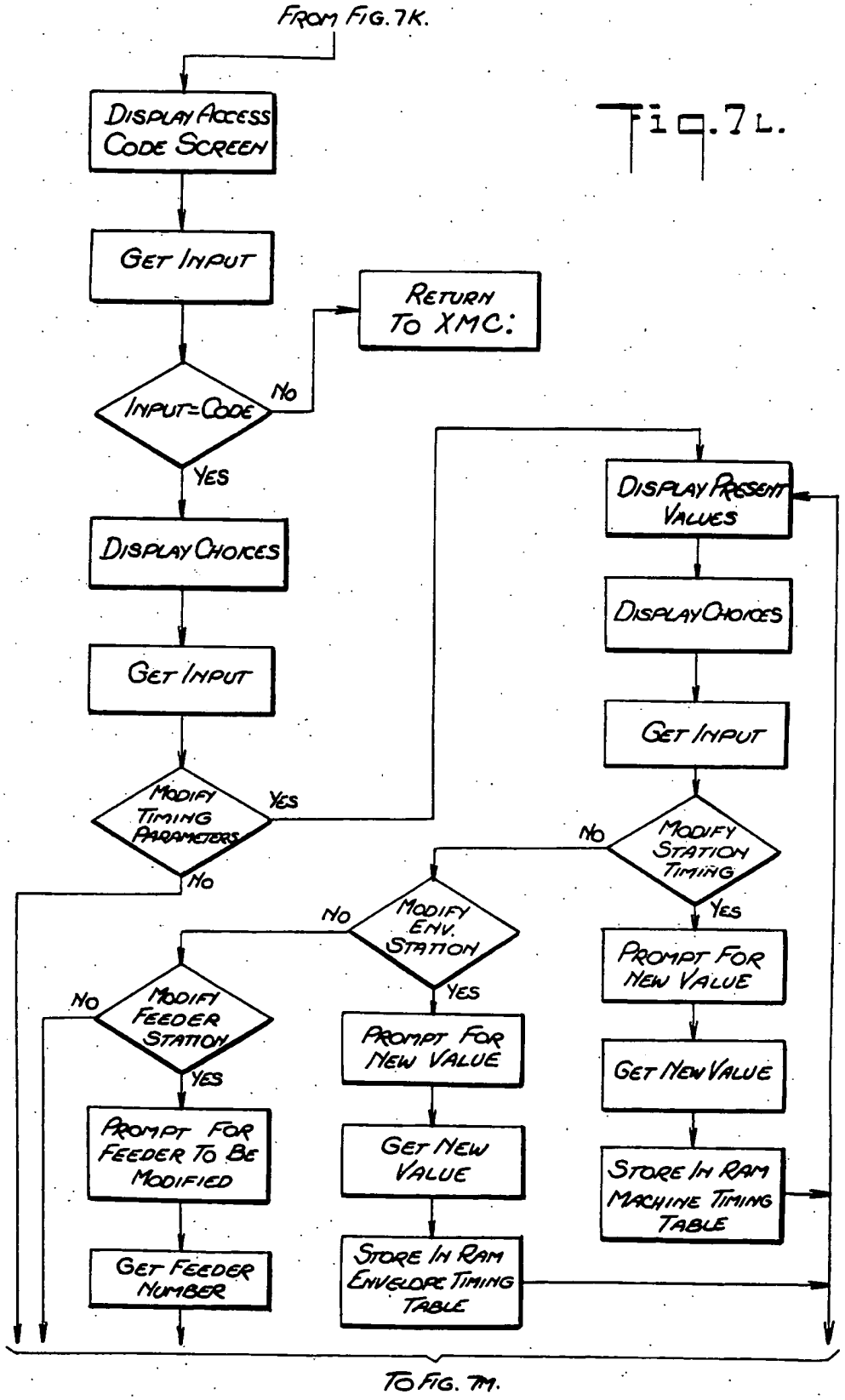

FROM FIG. 7K.
DISPLAY ACCESS CODE SCREEN
GET INPUT
RETURN TO XMC:
INPUT=CODE
No
Yes
DISPLAY CHOICES
GET INPUT
MODIFY TIMING PARAMETERS
Yes
No
DISPLAY PRESENT VALUES
DISPLAY CHOICES
GET INPUT
No
MODIFY STATION TIMING
Yes
PROMPT FOR NEW VALUE
GET NEW VALUE
STORE IN RAM MACHINE TIMING TABLE
No
MODIFY ENV. STATION
Yes
PROMPT FOR NEW VALUE
GET NEW VALUE
STORE IN RAM ENVELOPE TIMING TABLE
No
MODIFY FEEDER STATION
Yes
PROMPT FOR FEEDER TO BE MODIFIED
GET FEEDER NUMBER
TO FIG. 7M.

Fig. 7L.

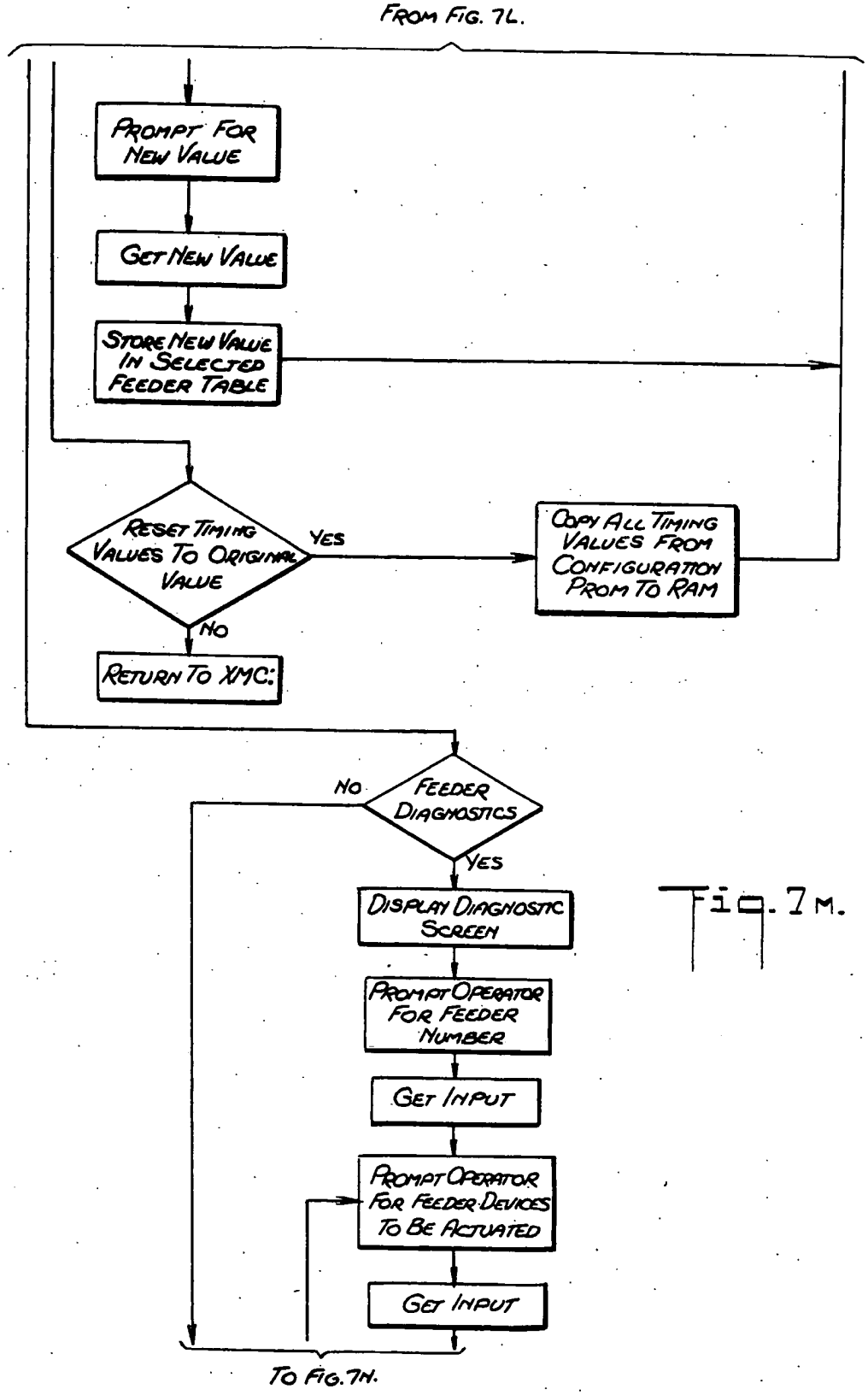

FROM FIG. 7L.
PROMPT FOR NEW VALUE
GET NEW VALUE
STORE NEW VALUE IN SELECTED FEEDER TABLE
RESET TIMING VALUES TO ORIGINAL VALUE
YES
COPY ALL TIMING VALUES FROM CONFIGURATION PROM TO RAM
NO
RETURN TO XMC:
NO
FEEDER DIAGNOSTICS
YES
DISPLAY DIAGNOSTIC SCREEN
PROMPT OPERATOR FOR FEEDER NUMBER
GET INPUT
PROMPT OPERATOR FOR FEEDER DEVICES TO BE ACTUATED
GET INPUT
TO FIG. 7N.

Fig. 7M.

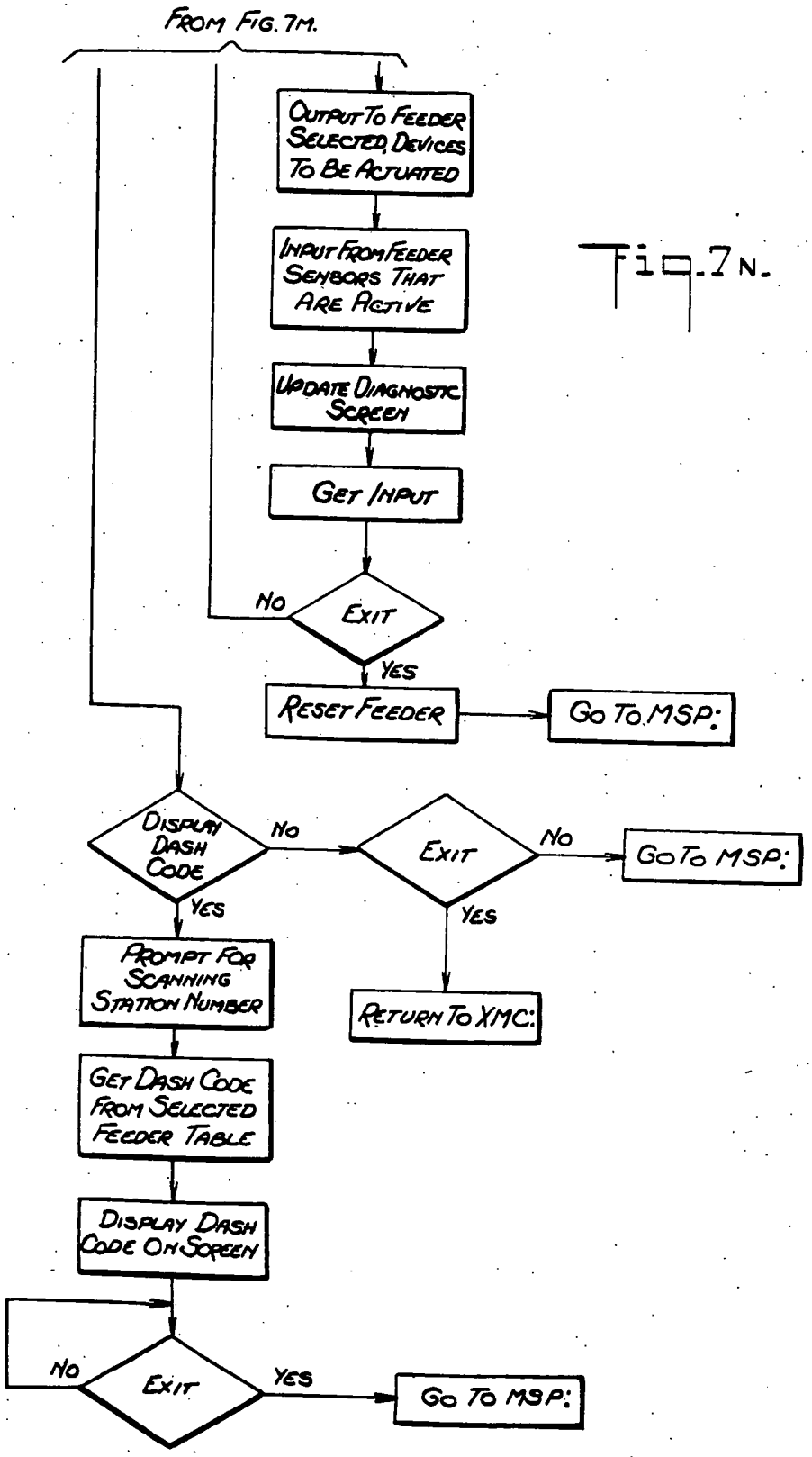

FROM FIG. 7M.
OUTPUT TO FEEDER SELECTED DEVICES TO BE ACTUATED
INPUT FROM FEEDER SENSORS THAT ARE ACTIVE
UPDATE DIAGNOSTIC SCREEN
GET INPUT
NO
EXIT
YES
RESET FEEDER
GO TO MSP:
DISPLAY DASH CODE
NO
EXIT
NO
GO TO MSP:
YES
YES
PROMPT FOR SCANNING STATION NUMBER
RETURN TO XMC:
GET DASH CODE FROM SELECTED FEEDER TABLE
DISPLAY DASH CODE ON SCREEN
NO
EXIT
YES
GO TO MSP:

Fig. 7N.

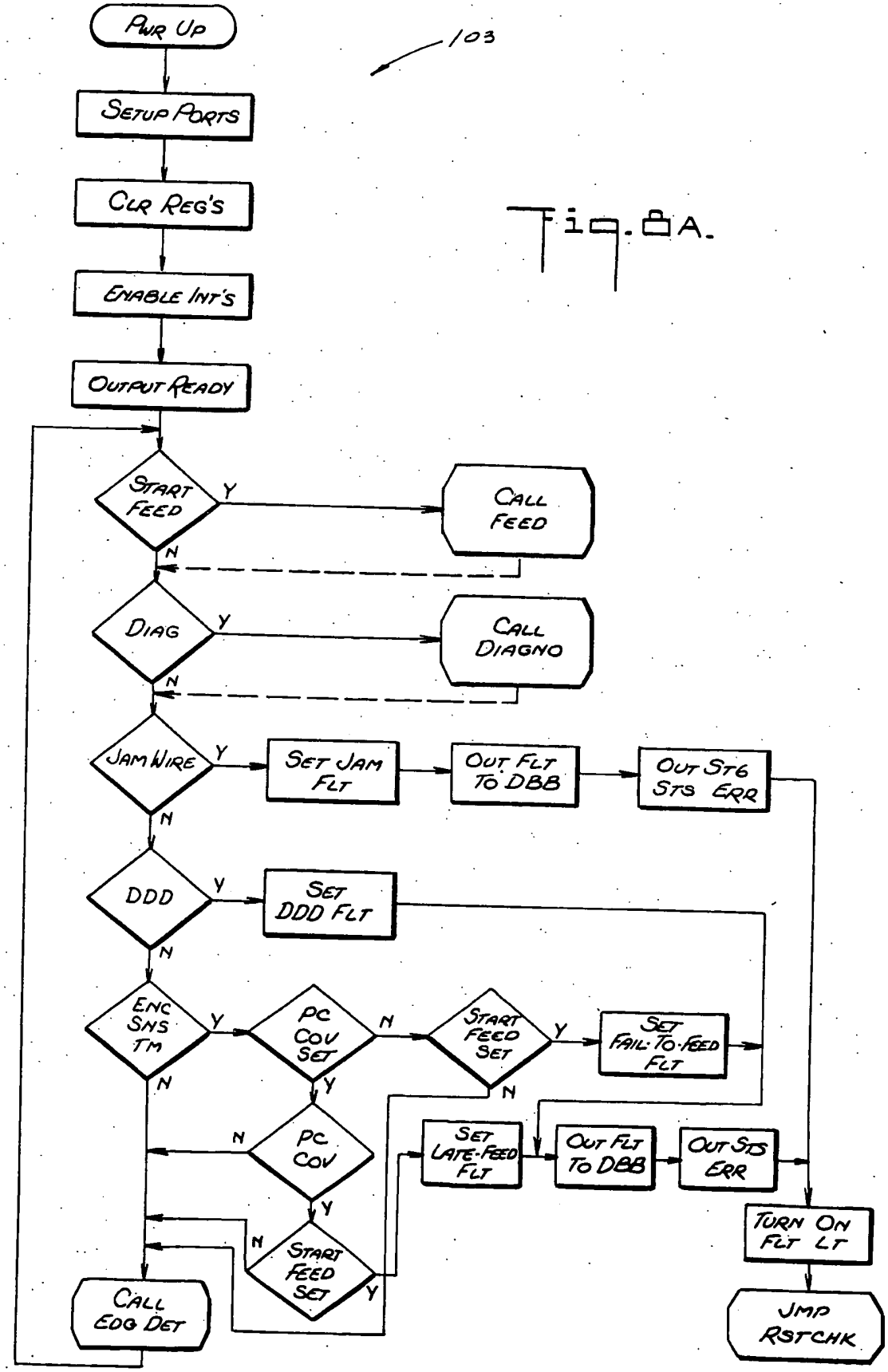

PWR UP
103
SETUP PORTS
CLR REG'S
ENABLE INT'S
OUTPUT READY
START FEED
Y
CALL FEED
N
DIAG
Y
CALL DIAGNO
N
JAM WIRE
Y
SET JAM FLT
OUT FLT TO DBB
OUT ST6 STS ERR
N
DDD
Y
SET DDD FLT
N
ENC SNS TM
Y
PC COV SET
N
START FEED SET
Y
SET FAIL-TO-FEED FLT
N
Y
N
PC COV
Y
SET LATE-FEED FLT
OUT FLT TO DBB
OUT STS ERR
N
START FEED SET
Y
TURN ON FLT LT
CALL EDG DET
JMP RSTCHK

Fig. 6A.

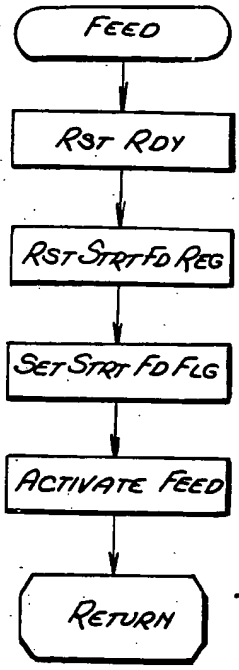


Fig. 8B.

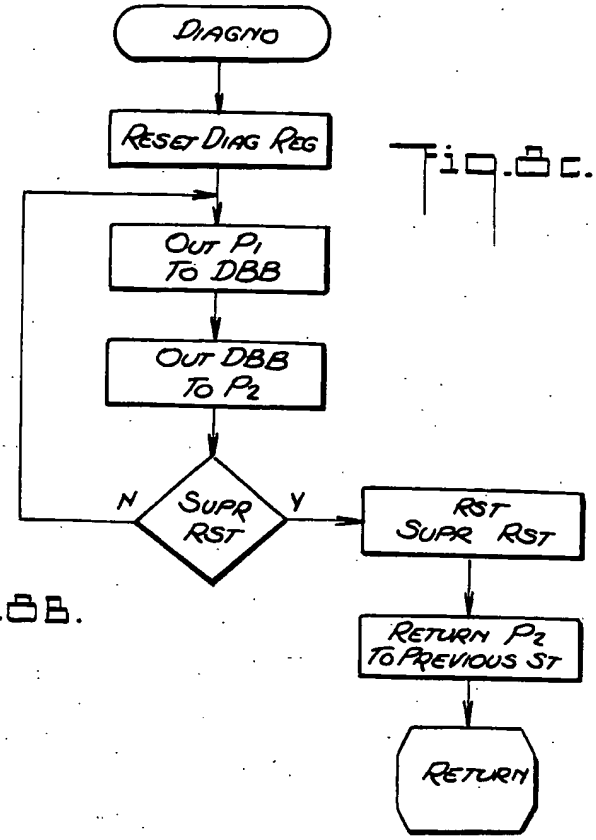


Fig. 8C.

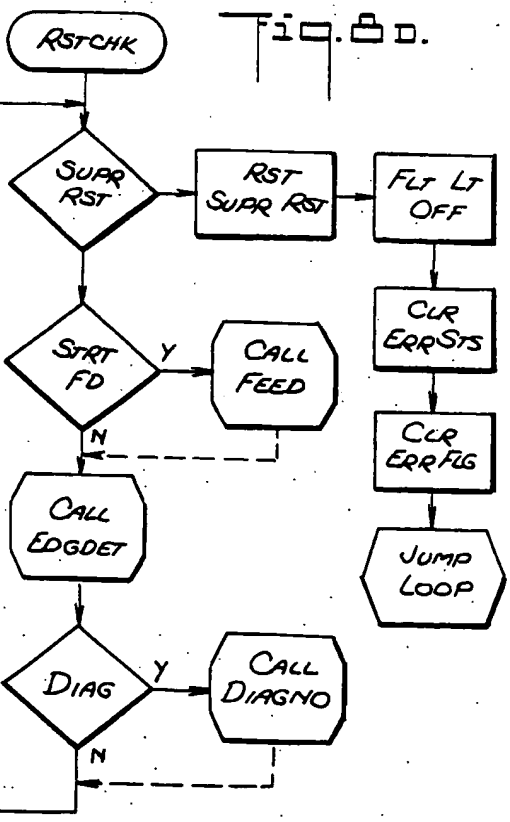


Fig. 8D.

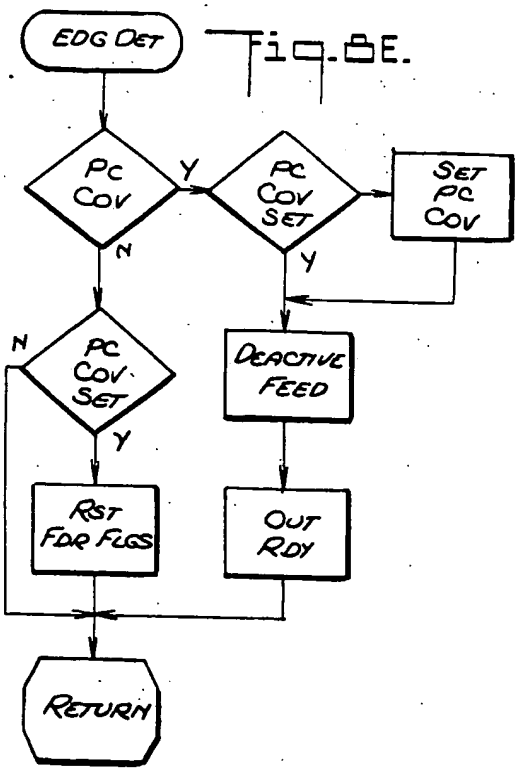


Fig. 8E.

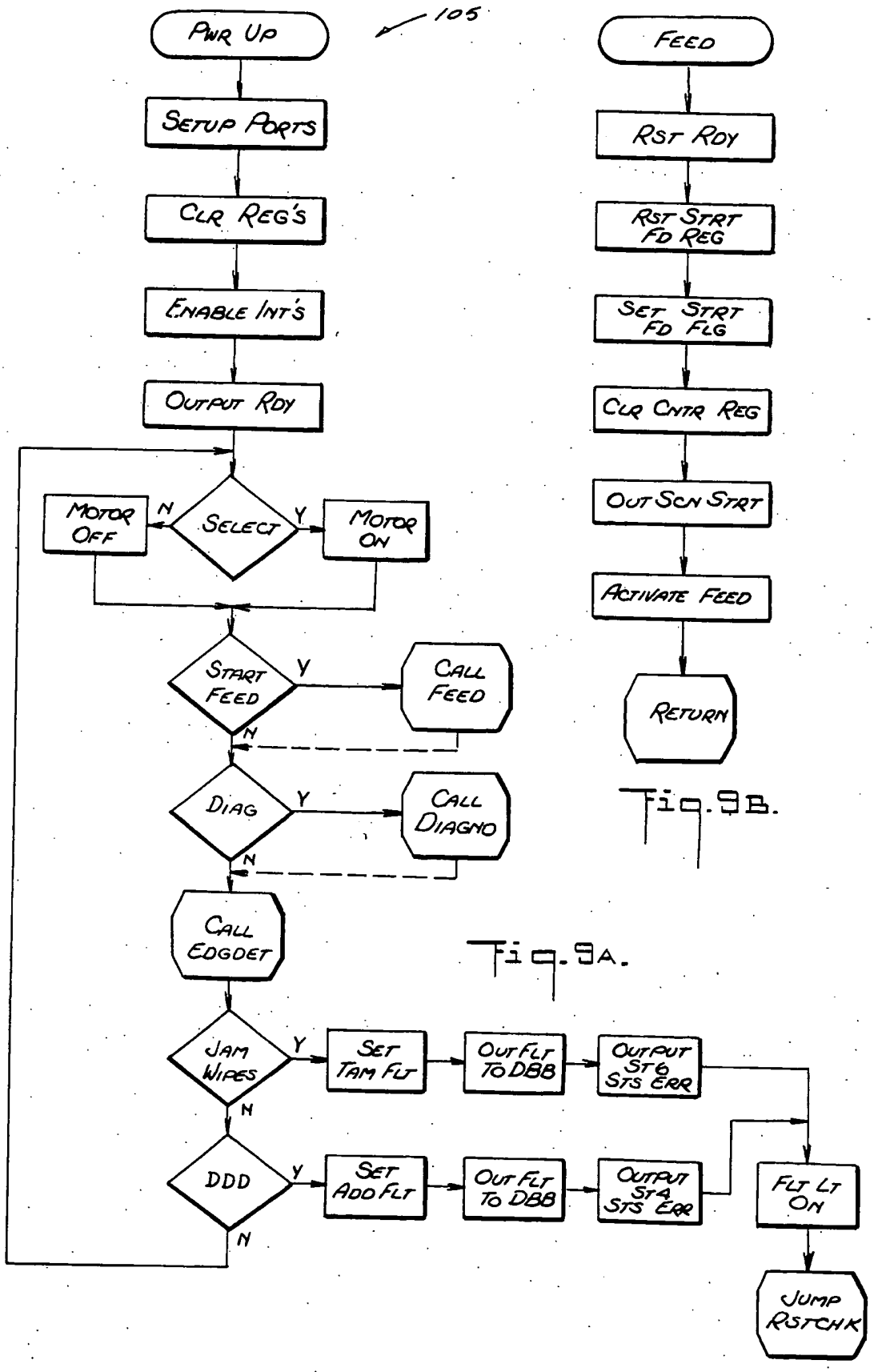

105
PWR UP
SETUP PORTS
CLR REG'S
ENABLE INT'S
OUTPUT RDY
MOTOR OFF
N
SELECT
Y
MOTOR ON
START FEED
Y
CALL FEED
N
DIAG
Y
CALL DIAGNO
N
CALL EDGDET
JAM WIPES
Y
SET TAM FLT
OUT FLT TO DBB
OUTPUT ST6 STS ERR
N
DDD
Y
SET ADD FLT
OUT FLT TO DBB
OUTPUT ST4 STS ERR
FLT LT ON
JUMP RSTCHK
N
FEED
RST RDY
RST STRT FD REG
SET STRT FD FLG
CLR CNTR REG
OUT SCN STRT
ACTIVATE FEED
RETURN

Fig. 9A.

Fig. 9B.

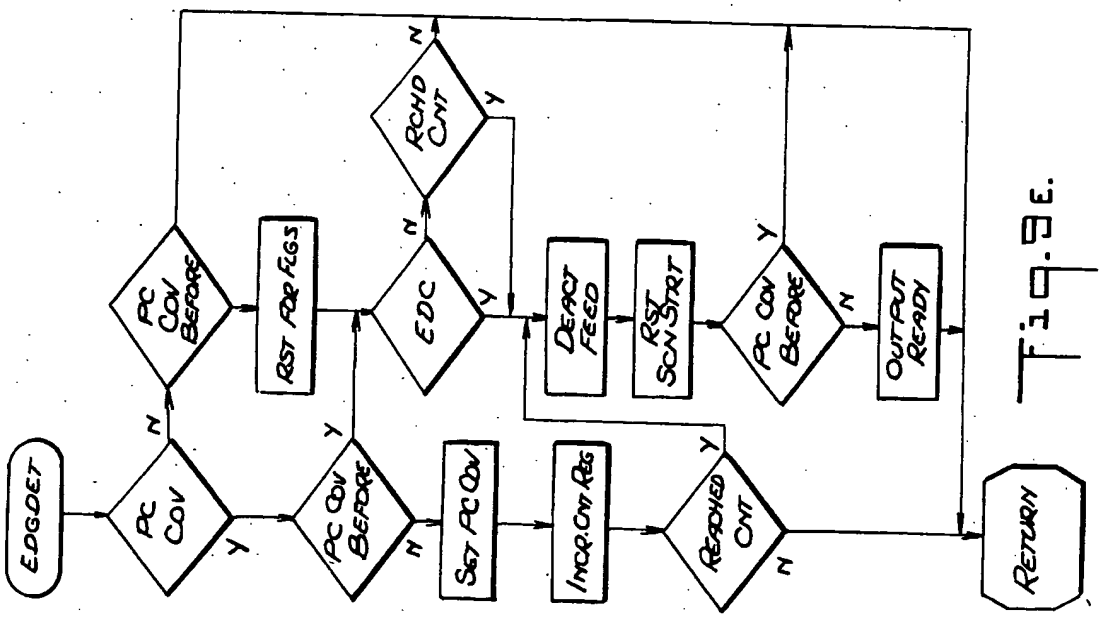


Fig. 9E.

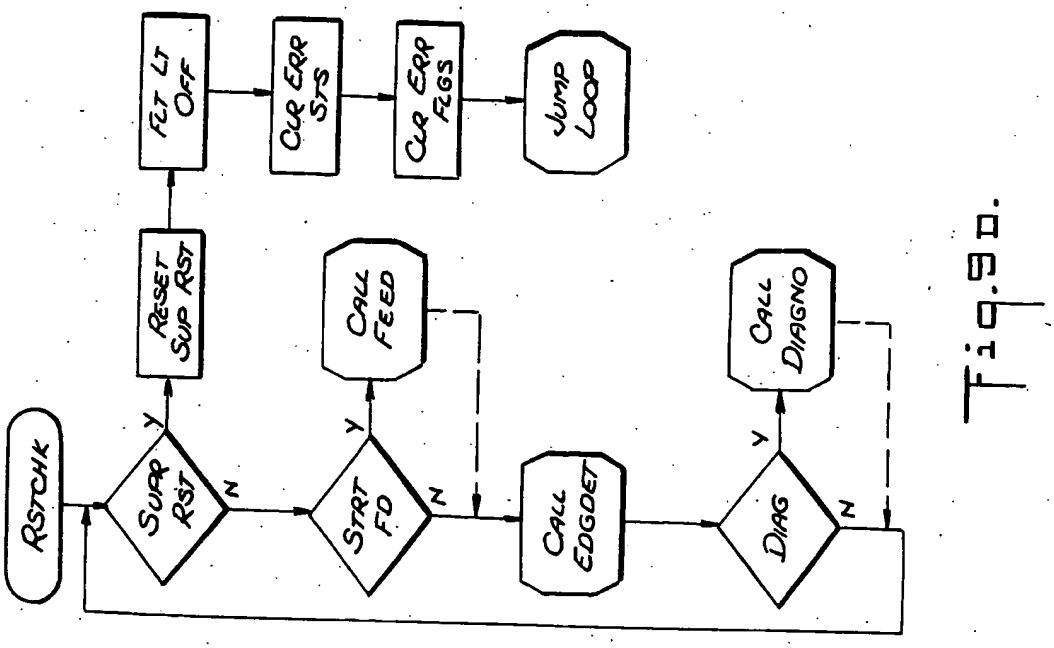


Fig. 9D.

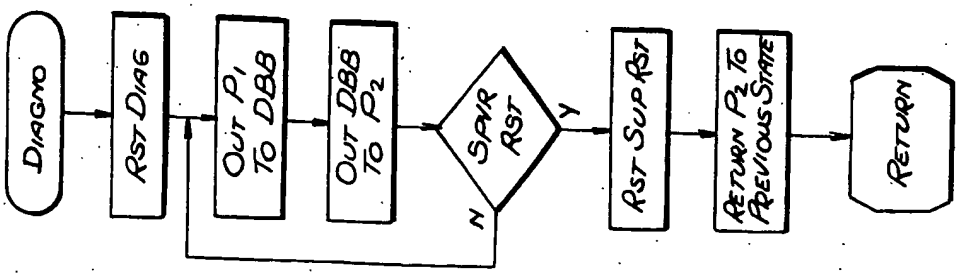


Fig. 9C.

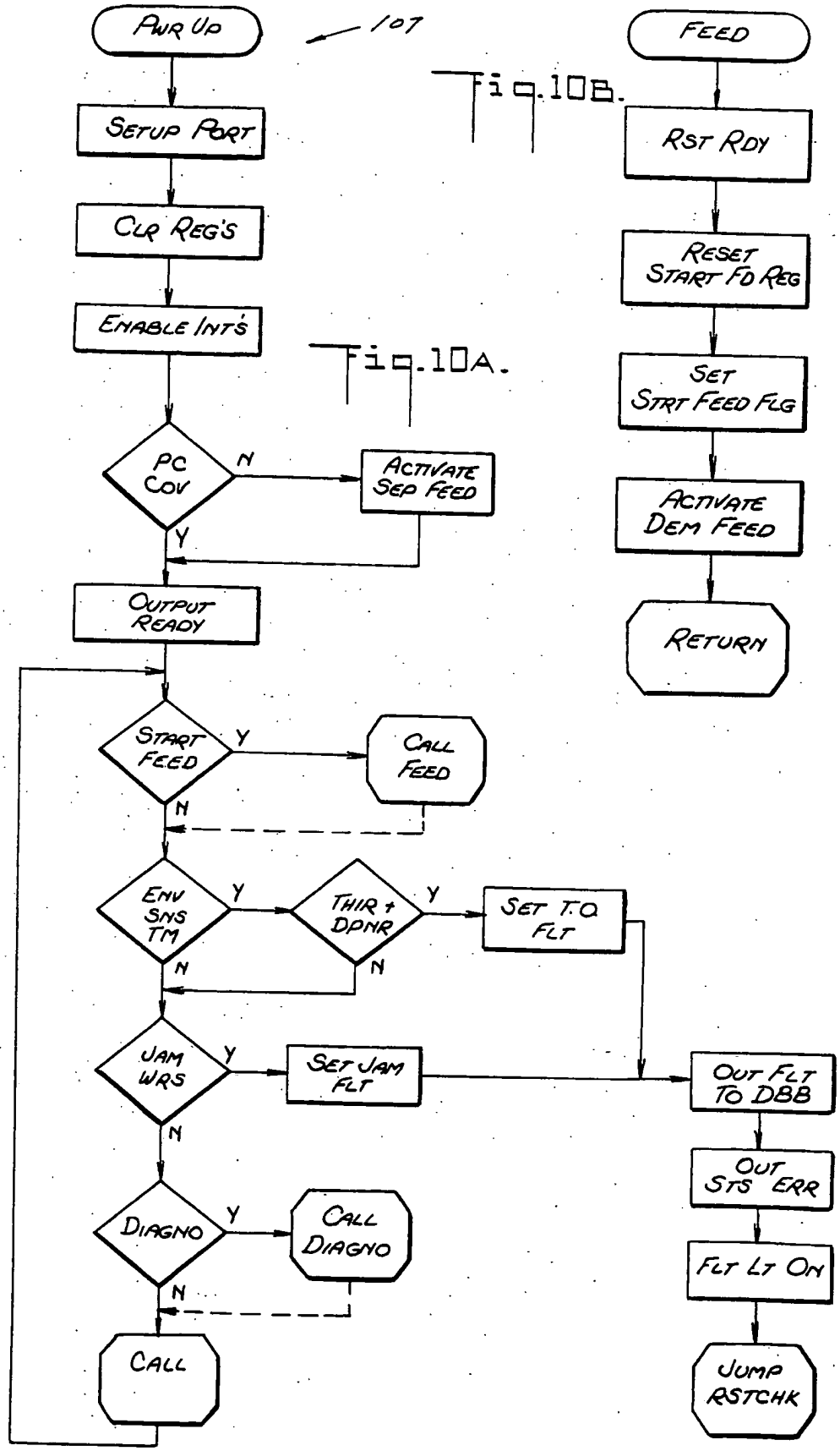


Fig. 10A.

Fig. 10B.

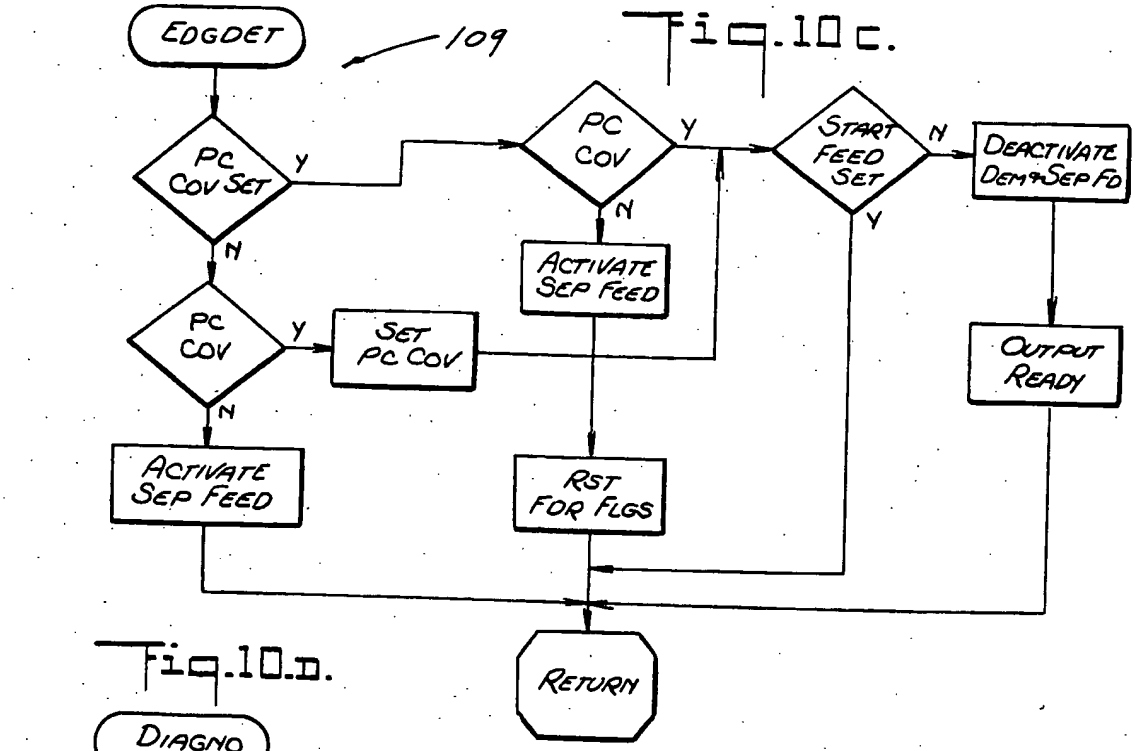


Fig. 10c.

Fig. 10d.

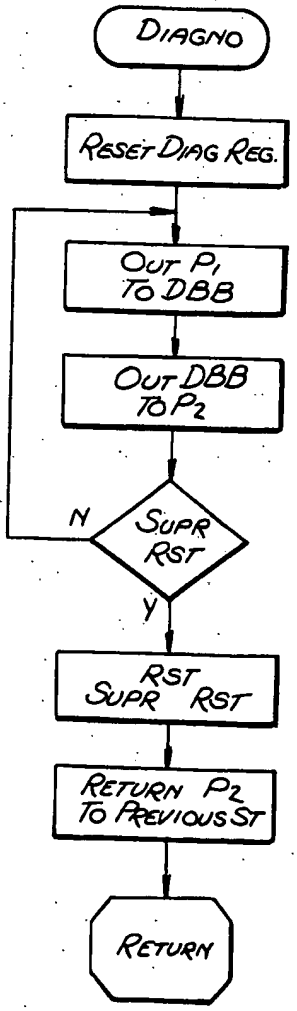


Fig. 10e.

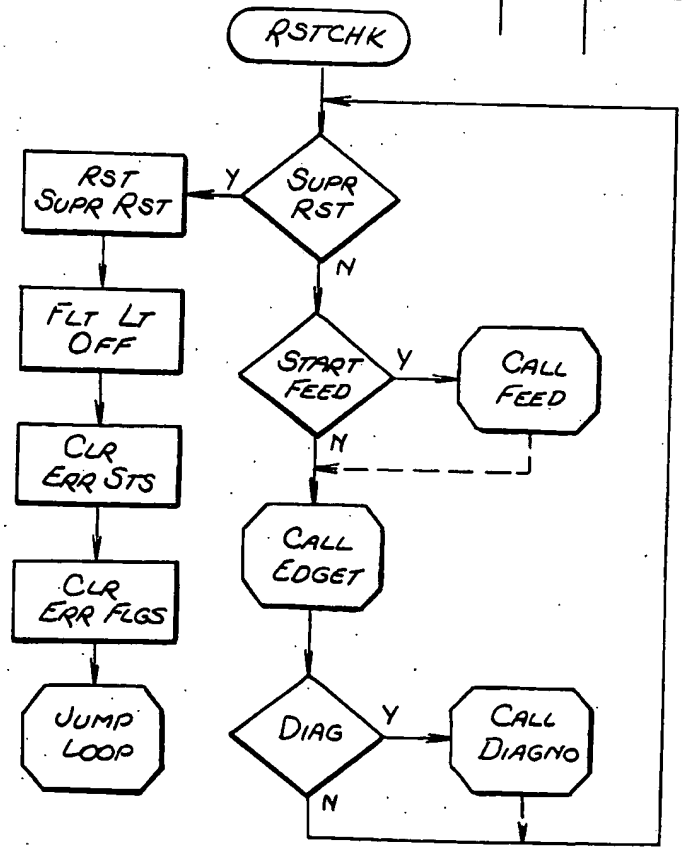


Fig.11A.

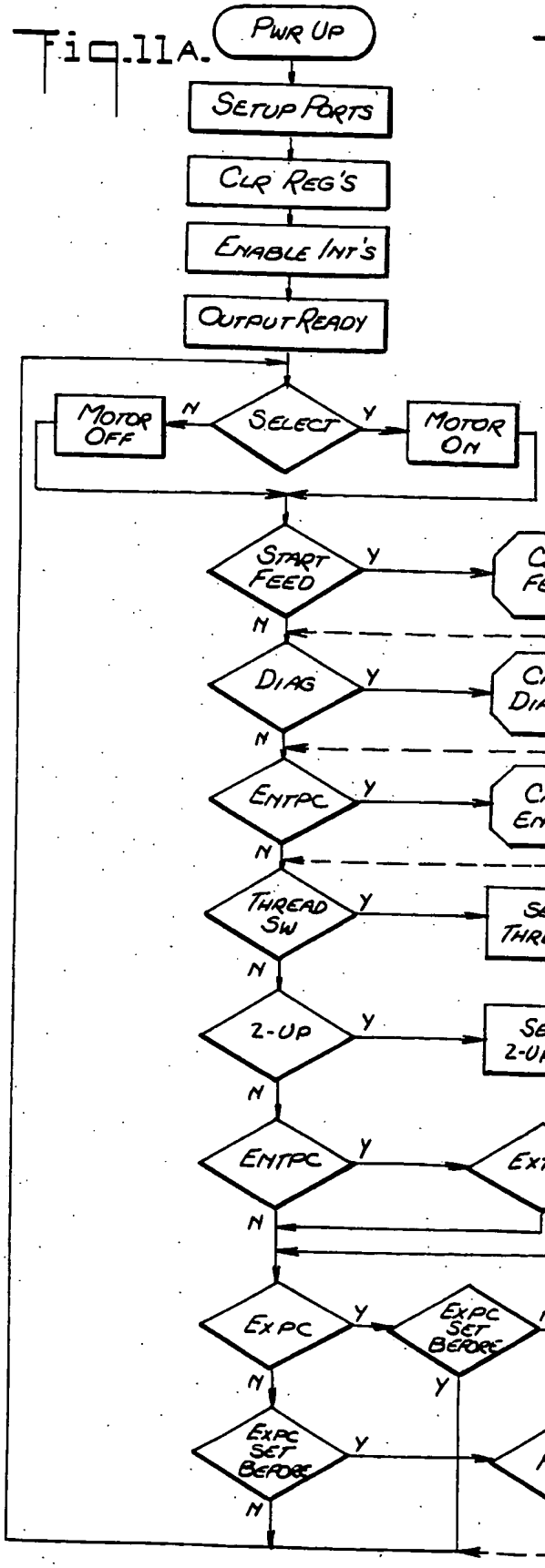
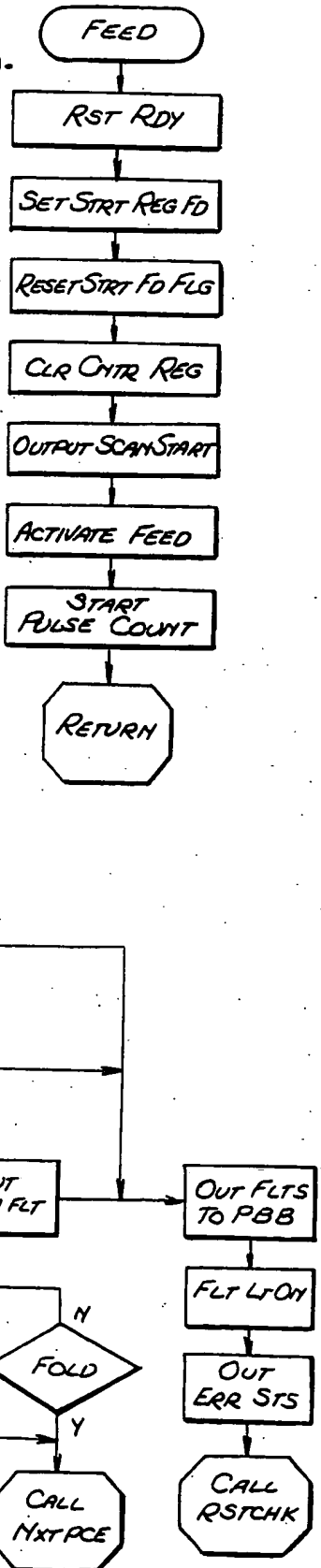


Fig.11B.



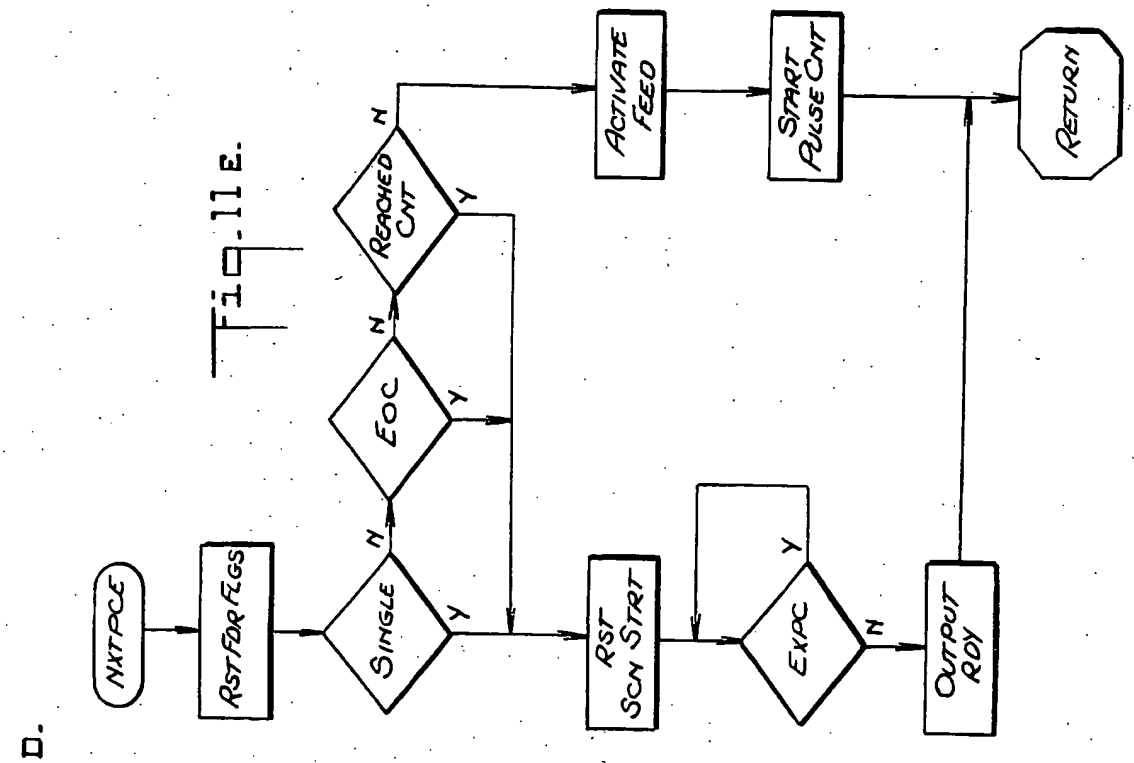


Fig. 11 E.

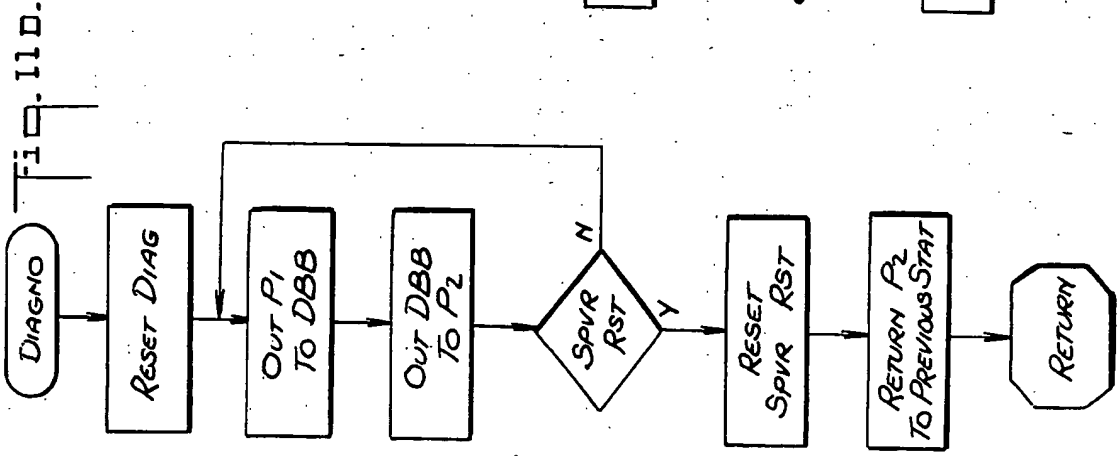


Fig. 11 D.

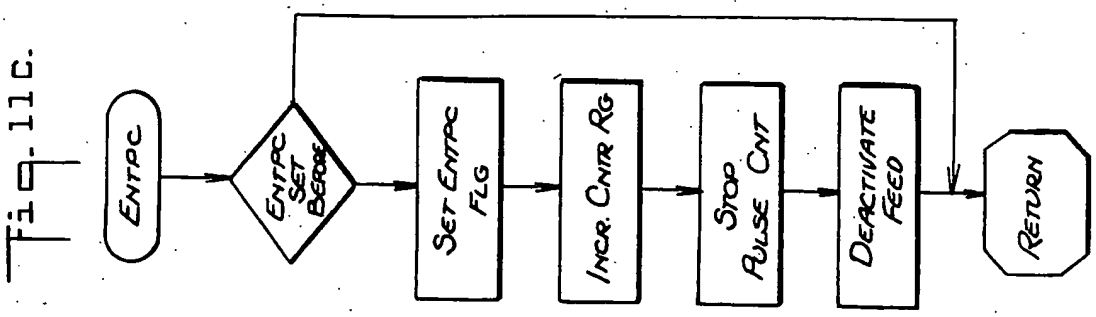


Fig. 11 C.

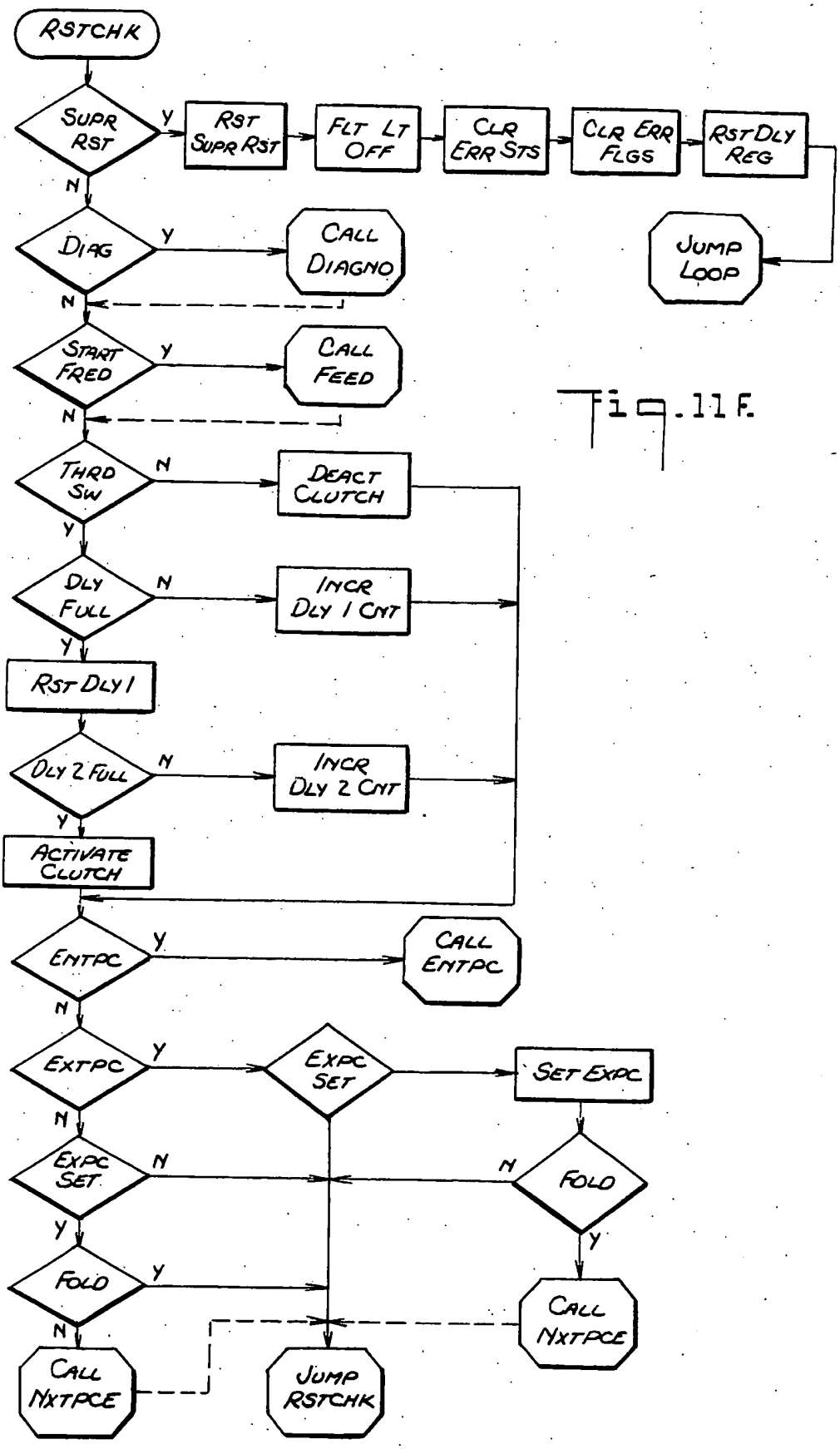

RSTCHK
SUPR RST
Y
RST SUPR RST
FLT LT OFF
CLR ERR STS
CLR ERR FLGS
RST DLY REG
JUMP LOOP
N
DIAG
Y
CALL DIAGNO
N
START FRED
Y
CALL FEED
N
THRD SW
N
DEACT CLUTCH
Y
DLY FULL
N
INCR DLY 1 CNT
Y
RST DLY 1
DLY 2 FULL
N
INCR DLY 2 CNT
Y
ACTIVATE CLUTCH
ENTPC
Y
CALL ENTPC
N
EXTPC
Y
EXPC SET
SET EXPC
N
EXPC SET
N
N
FOLD
Y
Y
FOLD
Y
CALL NXTPCE
N
CALL NXTPCE
JUMP RSTCHK

Fig. 11F.

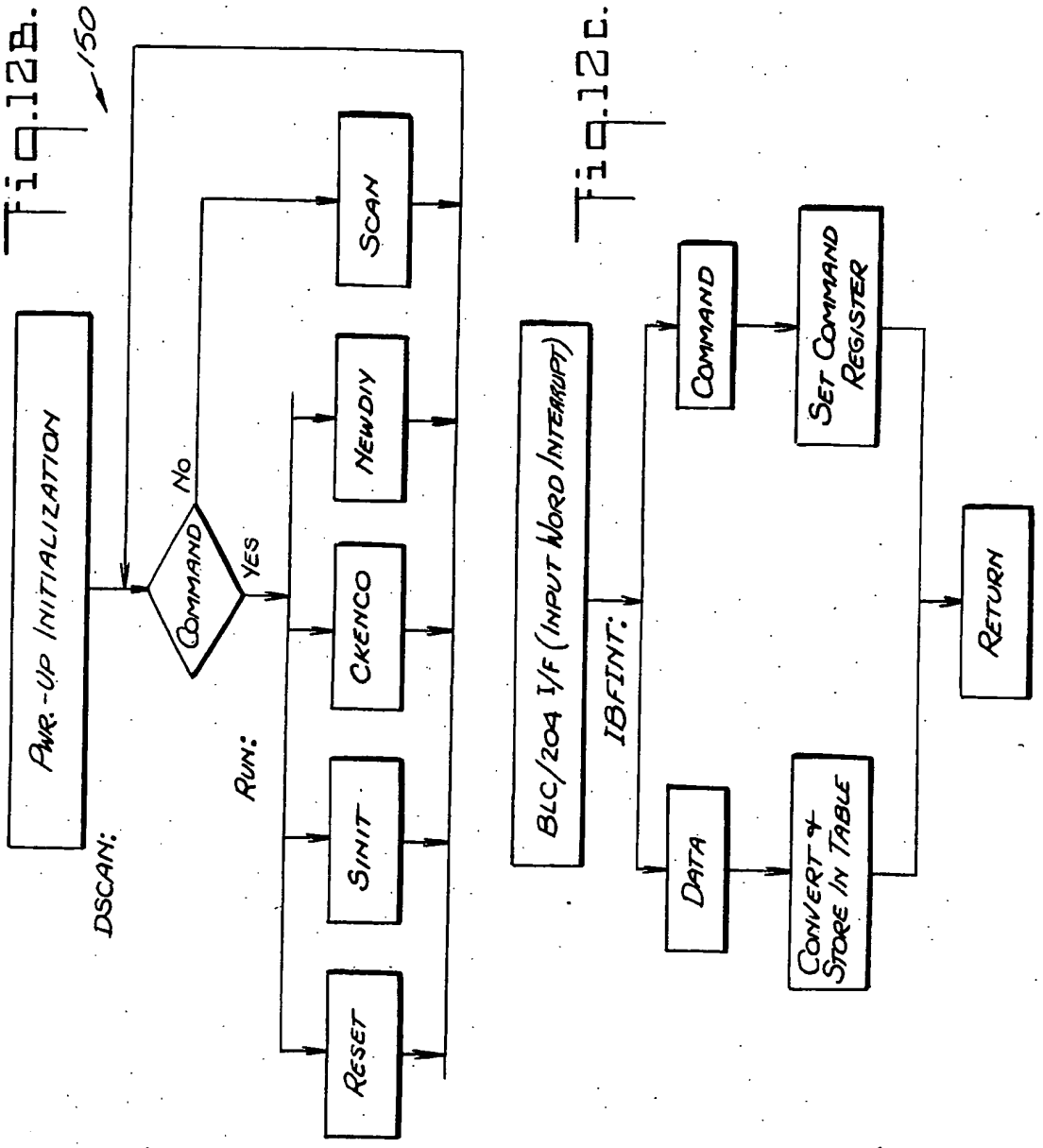


Fig. 12A.

:RINIT

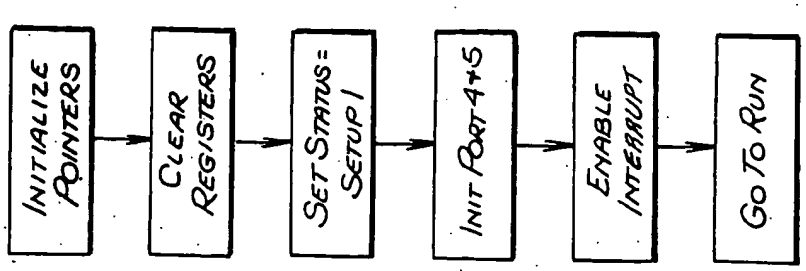


Fig. 12n.

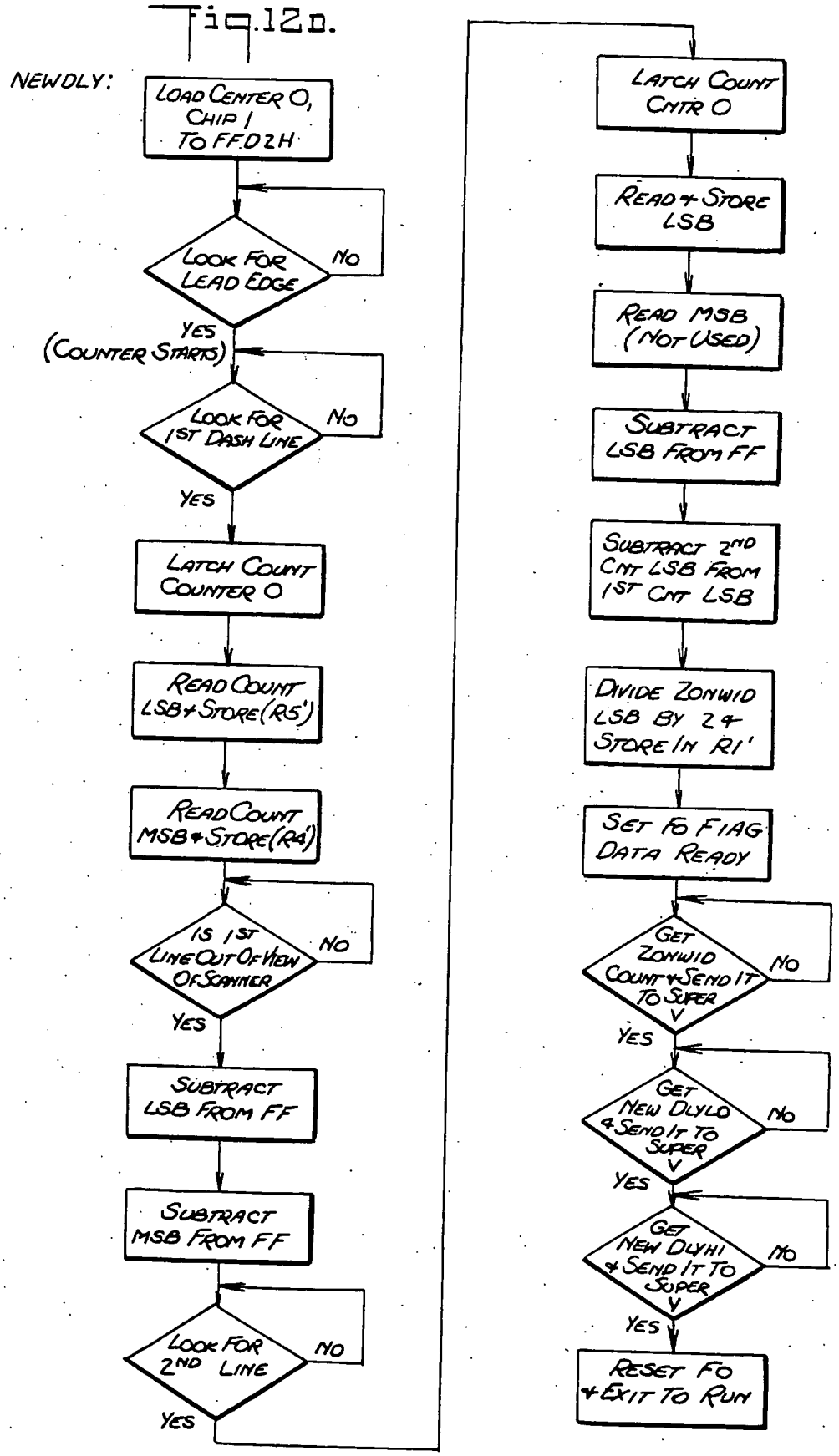
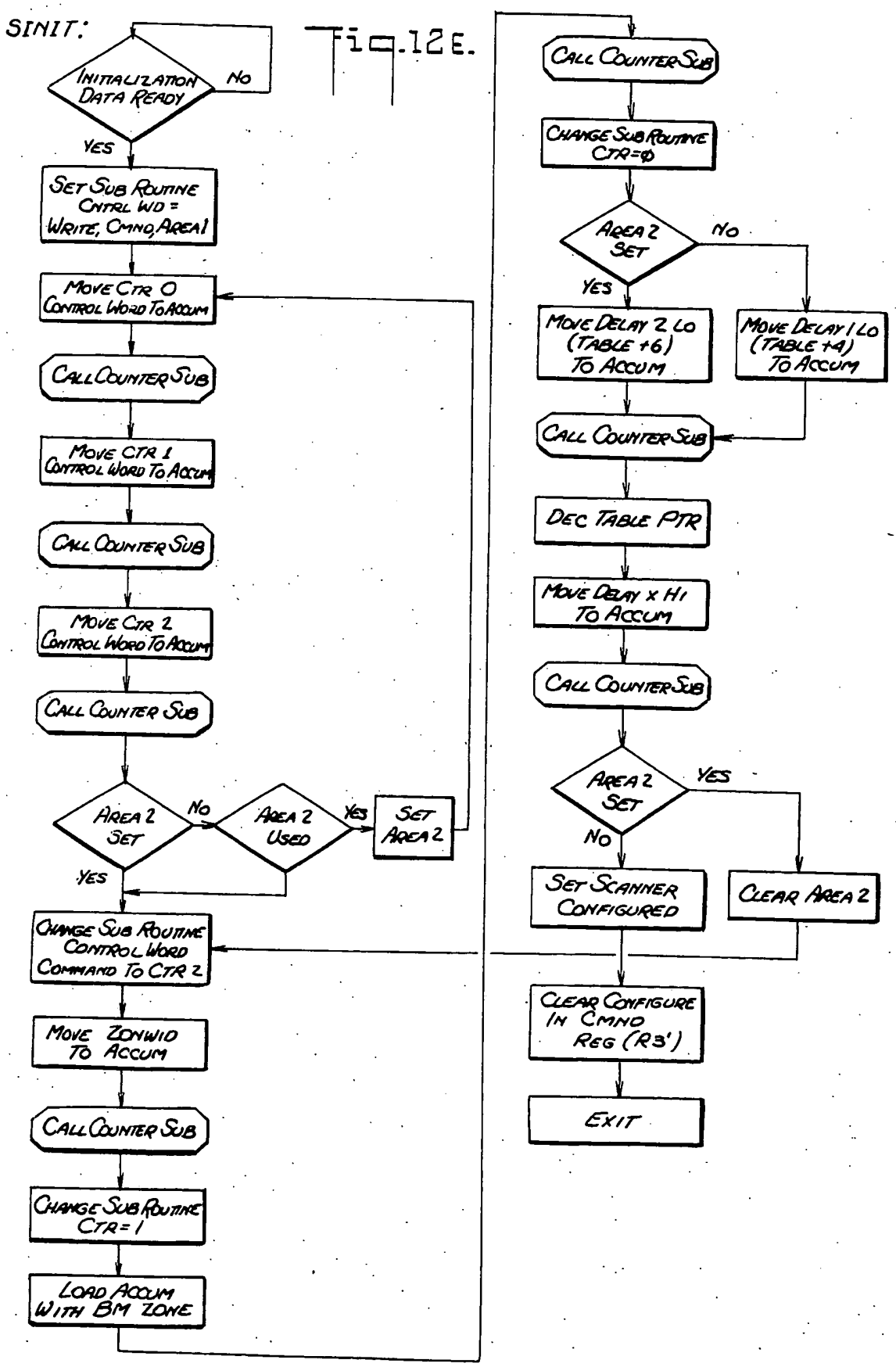


Fig. 12E.



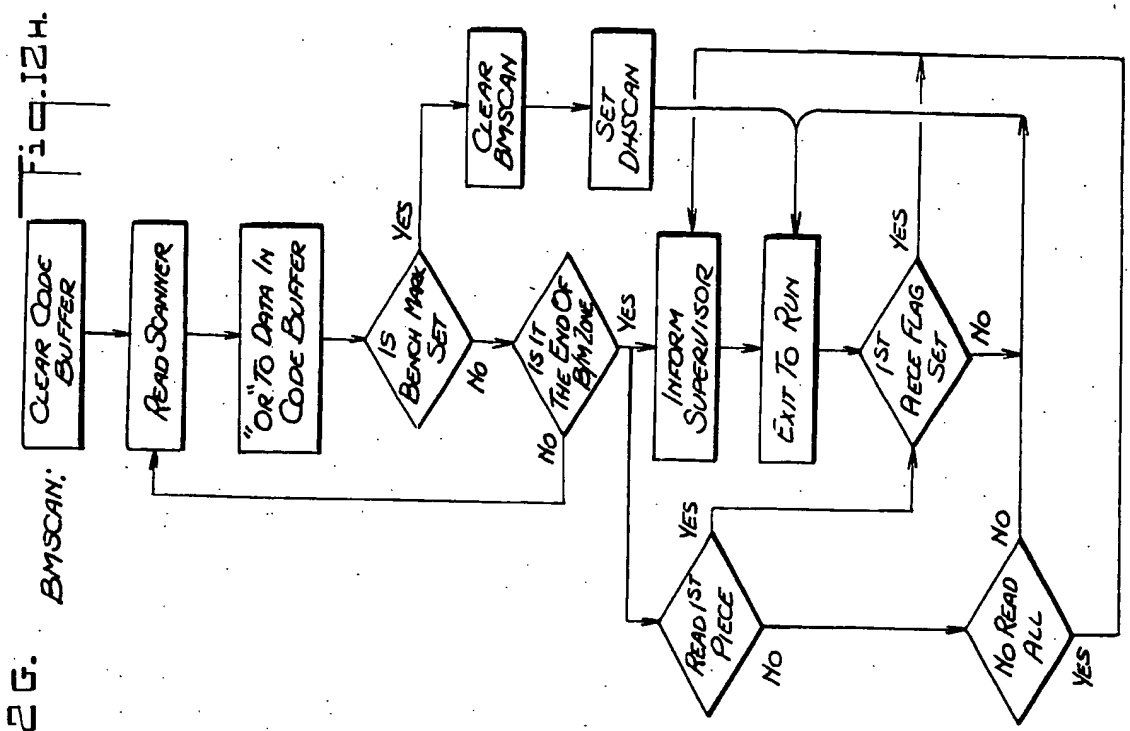


Fig. 12H.

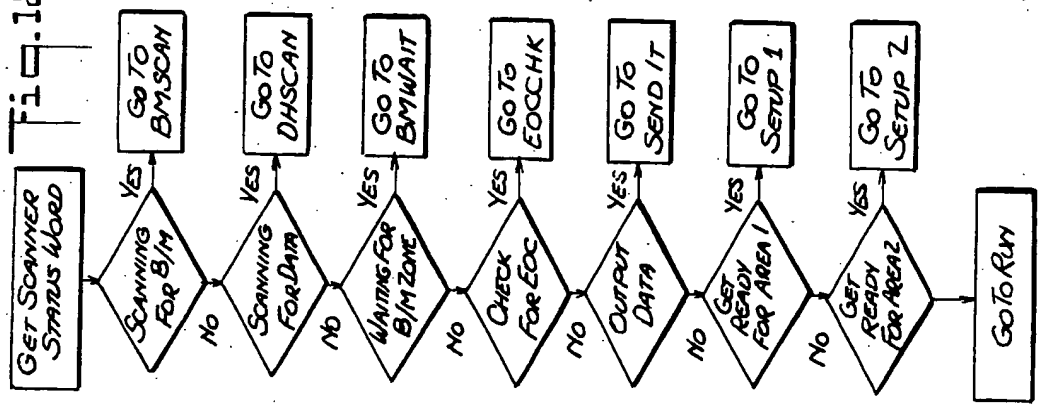


Fig. 12G.

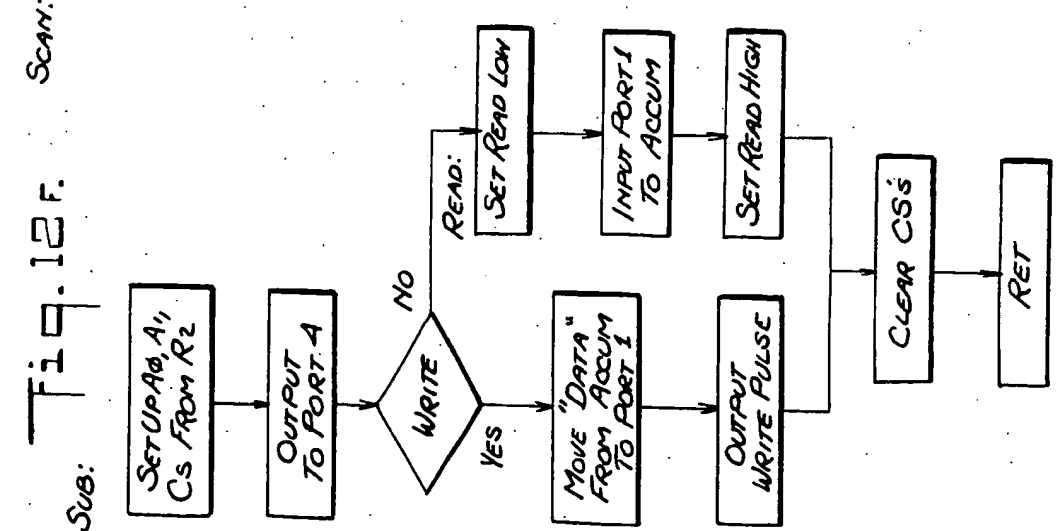
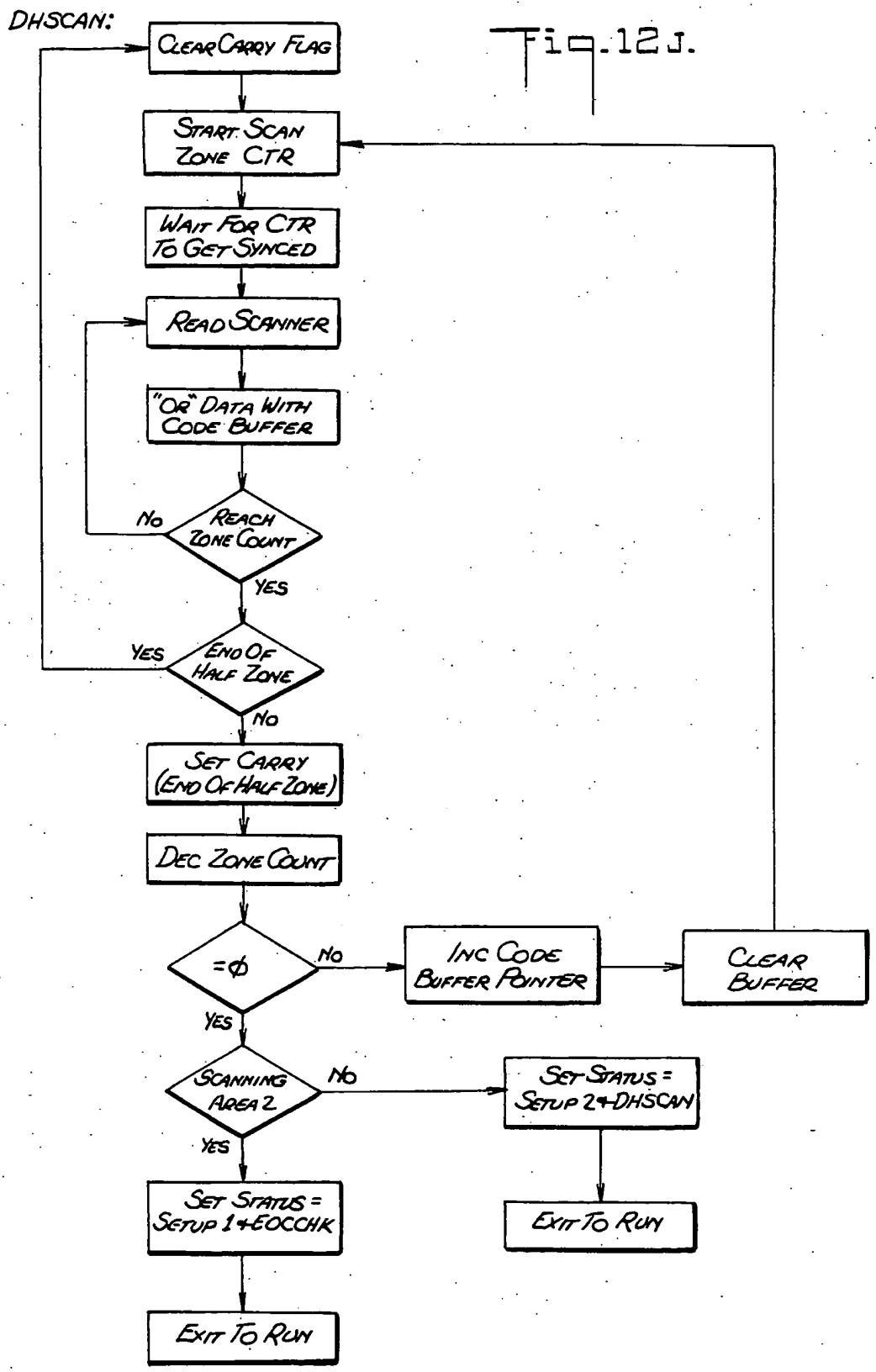


Fig. 12F.

Fig. 12J.


DHSCAN:
CLEAR CARRY FLAG
START SCAN ZONE CTR
WAIT FOR CTR TO GET SYNCED
READ SCANNER
"OR" DATA WITH CODE BUFFER
REACH ZONE COUNT
No
YES
END OF HALF ZONE
YES
No
SET CARRY (END OF HALF ZONE)
DEC ZONE COUNT
=ϕ
No
INC CODE BUFFER POINTER
CLEAR BUFFER
YES
SCANNING AREA 2
No
SET STATUS = SETUP 2+DHSCAN
YES
SET STATUS = SETUP 1+EOCCHK
EXIT TO RUN
EXIT TO RUN

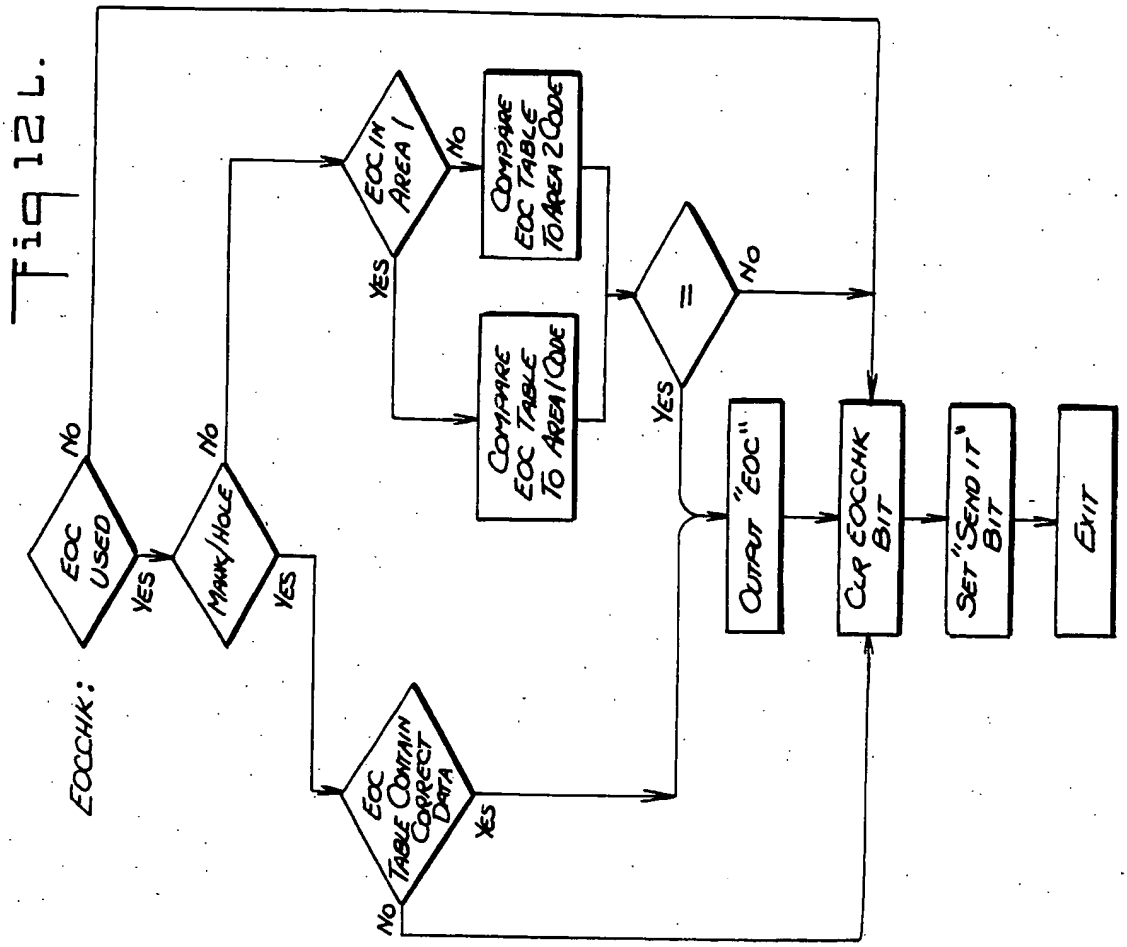


Fig 12L.

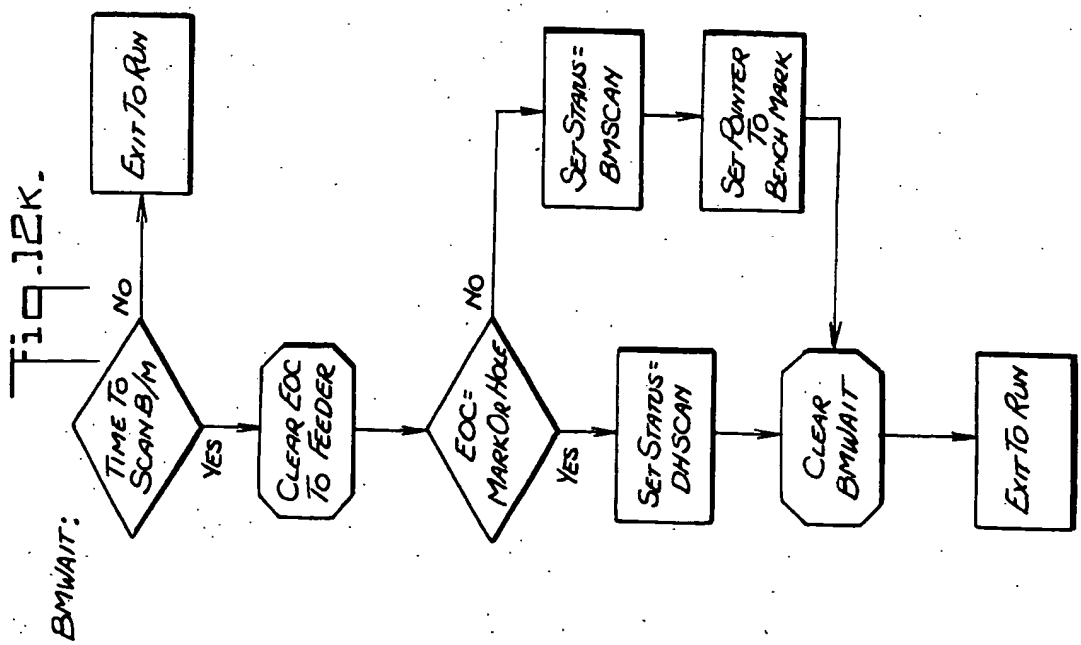


Fig. 12K.

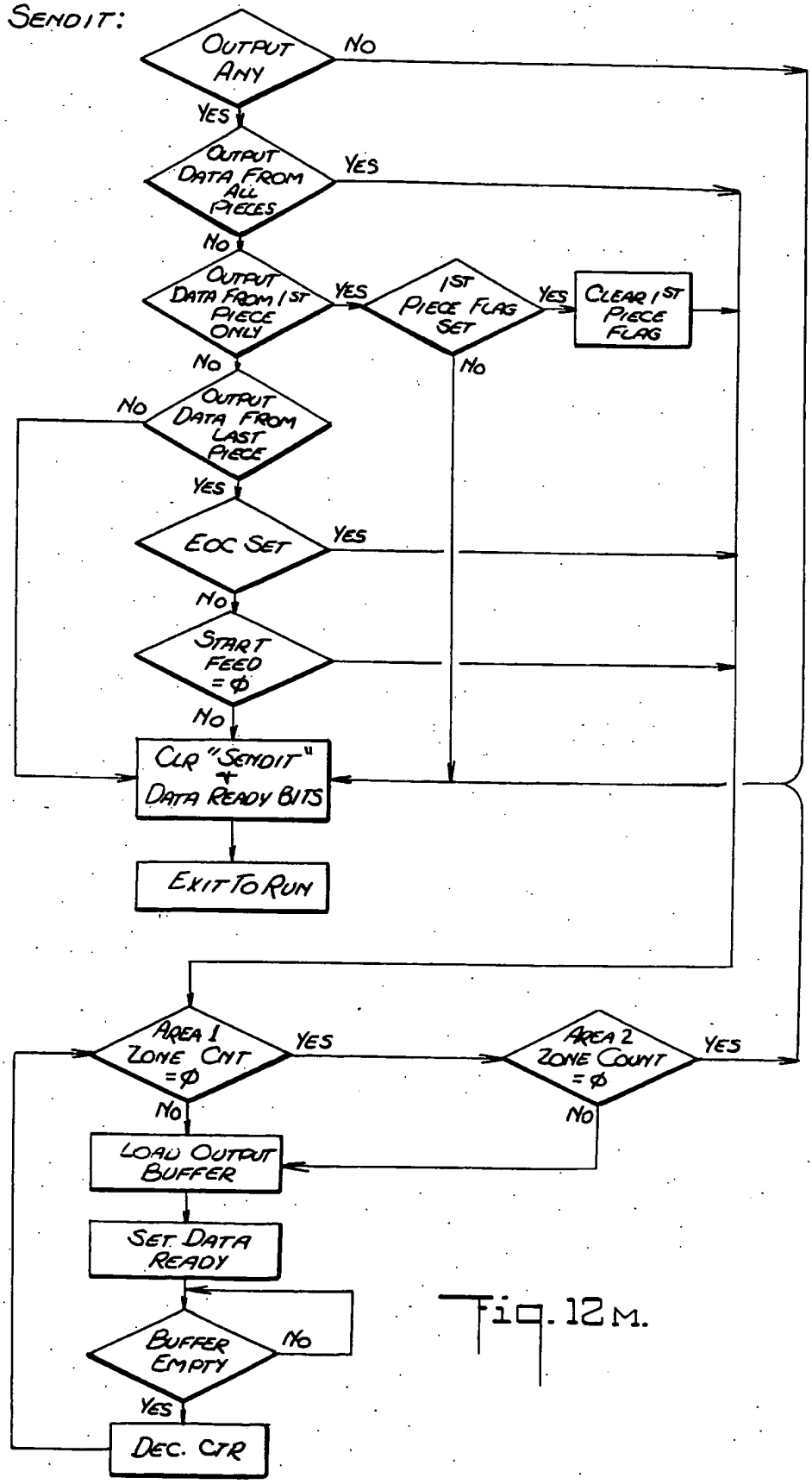

SENDIT:
OUTPUT ANY
NO
YES
OUTPUT DATA FROM ALL PIECES
YES
NO
OUTPUT DATA FROM 1ST PIECE ONLY
YES
1ST PIECE FLAG SET
YES
CLEAR 1ST PIECE FLAG
NO
NO
OUTPUT DATA FROM LAST PIECE
NO
YES
EOC SET
YES
NO
START FEED = Φ
NO
CLR "SENDIT" + DATA READY BITS
EXIT TO RUN
AREA 1 ZONE CNT = Φ
YES
AREA 2 ZONE COUNT = Φ
YES
NO
NO
LOAD OUTPUT BUFFER
SET DATA READY
BUFFER EMPTY
NO
YES
DEC. CTR

Fig. 12M.

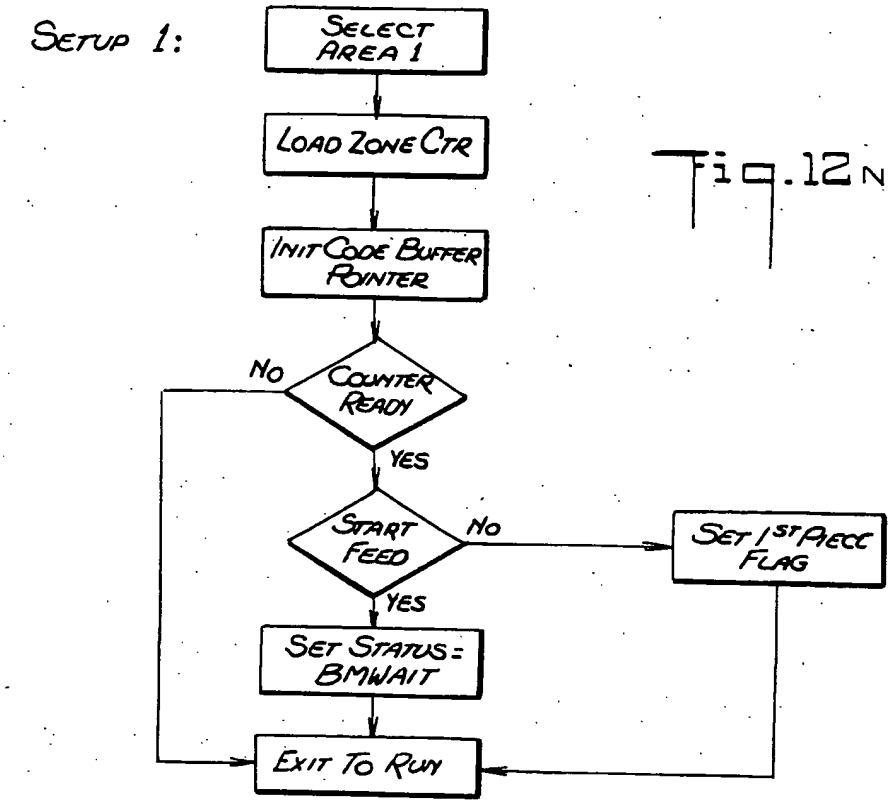
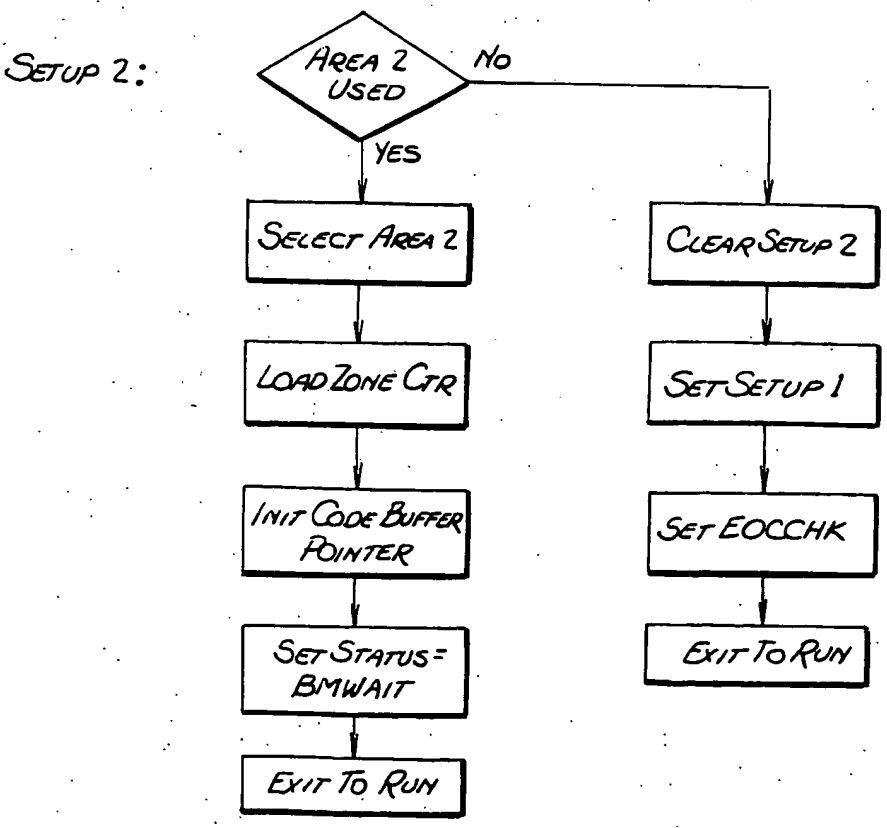


Fig. 12N.



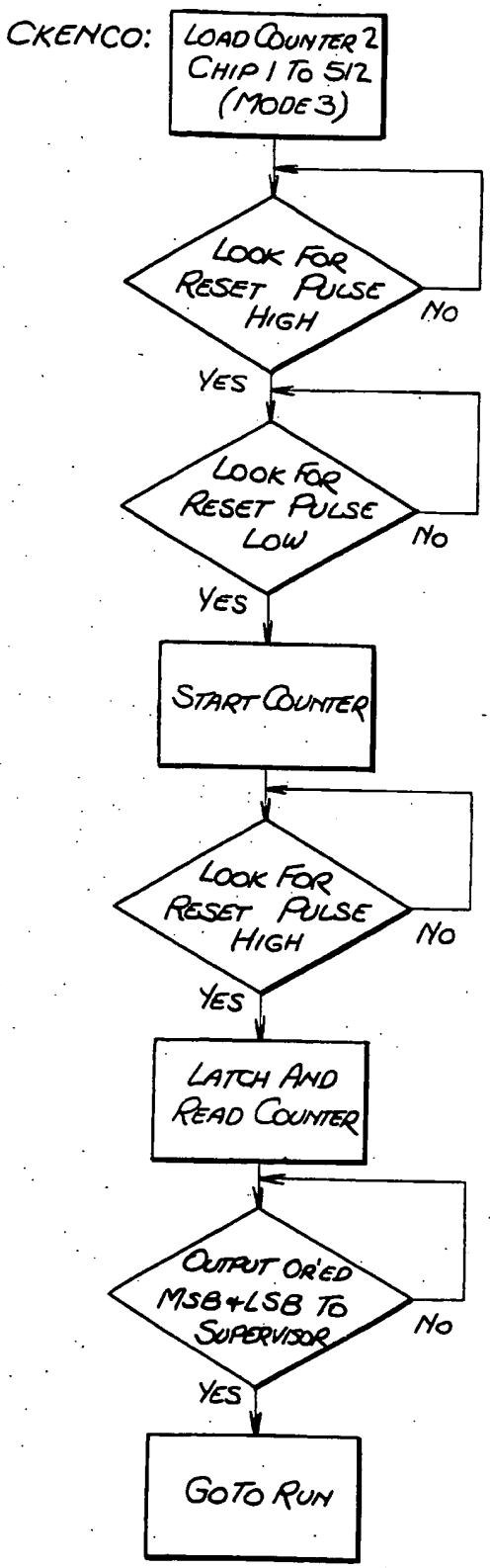

CKENCO:
LOAD COUNTER 2 CHIP 1 TO 512 (MODE 3)
LOOK FOR RESET PULSE HIGH
NO
YES
LOOK FOR RESET PULSE LOW
NO
YES
START COUNTER
LOOK FOR RESET PULSE HIGH
NO
YES
LATCH AND READ COUNTER
OUTPUT OR'ED MSB+LSB TO SUPERVISOR
NO
YES
GOTO RUN

Fig. 12P.

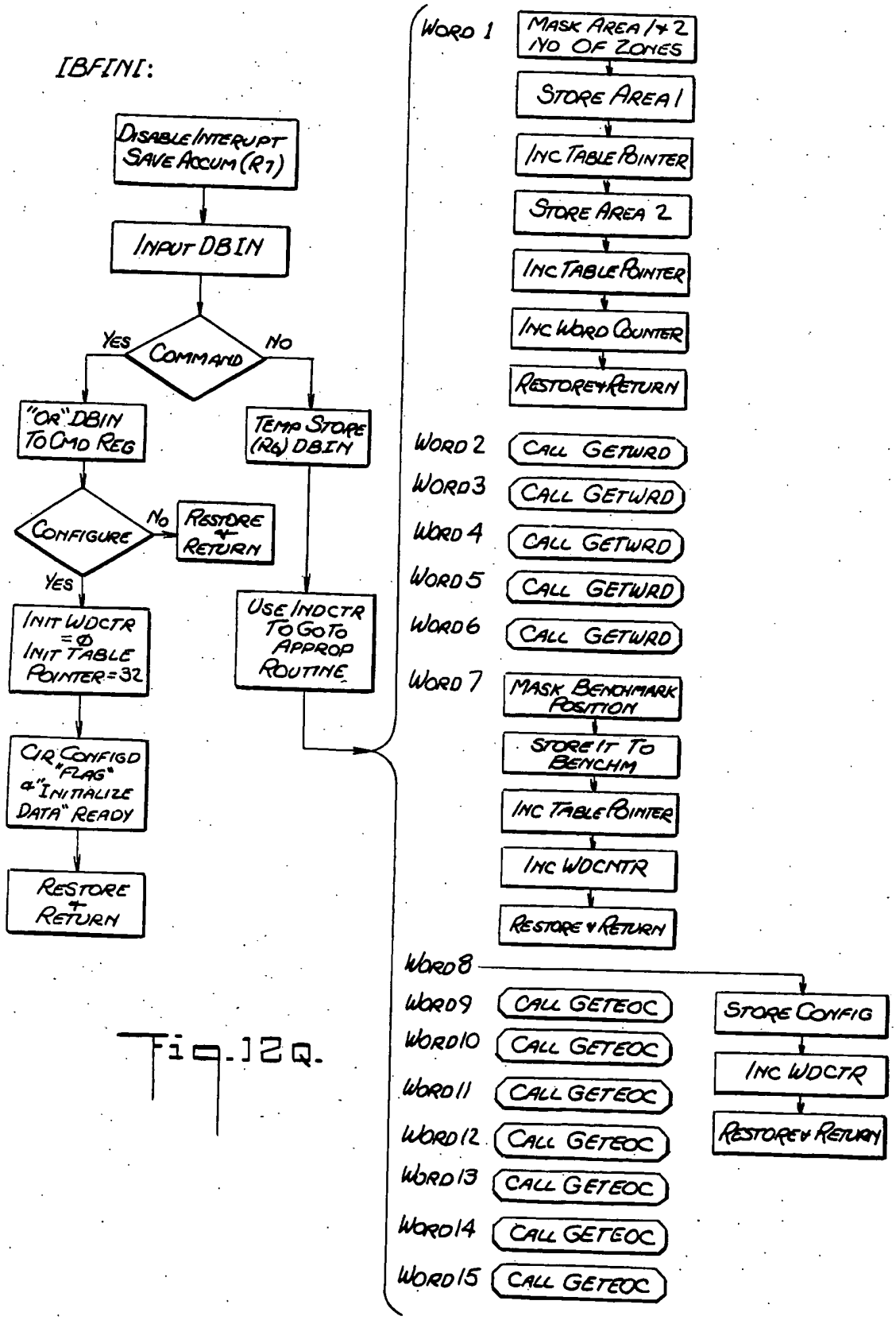
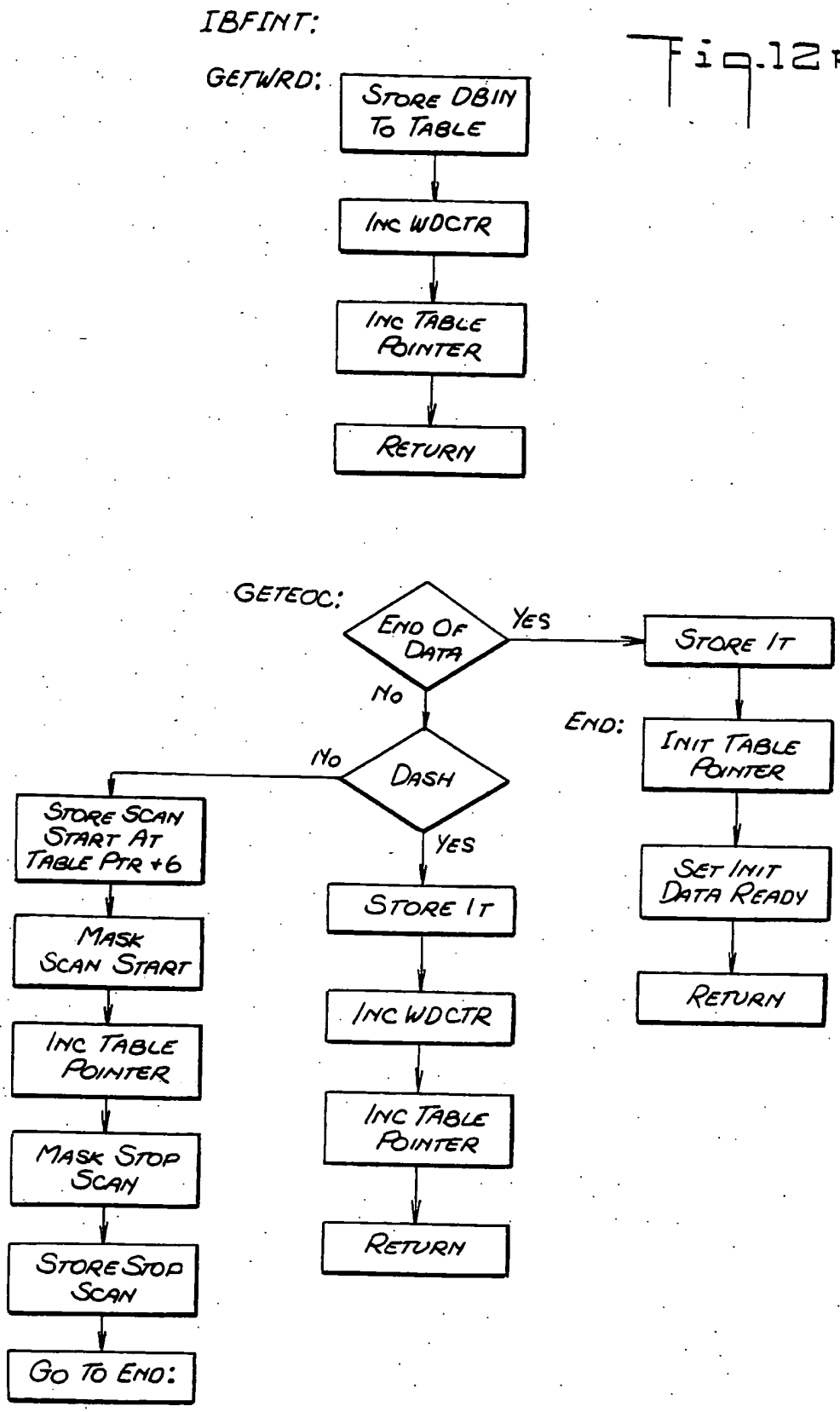


Fig. 12Q.

Fig. 12R.


IBFINT:
GETWRD:
STORE DBIN TO TABLE
INC WDCTR
INC TABLE POINTER
RETURN
GETEOC:
END OF DATA
YES
STORE IT
END:
INIT TABLE POINTER
SET INIT DATA READY
RETURN
NO
DASH
NO
YES
STORE SCAN START AT TABLE PTR +6
MASK SCAN START
INC TABLE POINTER
MASK STOP SCAN
STORE STOP SCAN
GO TO END:
STORE IT
INC WDCTR
INC TABLE POINTER
RETURN

UNIVERSAL MULTI-STATION DOCUMENT INSERTER

MICROFICHE APPENDIX

The supervisory program for the central processor is set forth in the accompanying Microfiche Appendix including 3 microfiche having a total of 173 frames.

The program for configuring the configuration PROM of the central processor is set forth in the accompanying Microfiche Appendix in PASCAL language including 1 microfiche having a total of 56 frames.

The programs for a high ratio feeder, high speed feeder, envelope feeder, and burster-folder are set forth in the accompanying Microfiche Appendix including 1 microfiche having a total of 36 frames.

The program for the scanner interface circuits is set forth in the accompanying Microfiche Appendix including 1 microfiche having a total of 27 frames.

BACKGROUND OF THE INVENTION

The present invention relates to document inserters, and more particularly to multi-station document inserters.

Known multi-station document inserters generally employ discrete elements and are manufactured and wired for each specific customer application. Each such document inserter is manufactured as virtually a one of a kind machine with the attendant costs associated therewith. Such apparatus typically require many weeks to design and manufacture, require substantial operator training time to operate, and are difficult and time consuming to service. One such multi-station document inserter is disclosed in U.S. Pat. No. 3,606,728 issued on Sept. 21, 1971, to Sather et al., and assigned to Bell and Howell Company, Phillipsburg, New Jersey.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a universal multi-station document inserter.

It is a further object of the present invention to provide a universal multi-station document inserter which may be readily adapted to a particular customer application without reprogramming.

It is a further object of the present invention to provide a modularly expandable multi-station document inserter.

It is a still further object of the present invention to provide a multi-station document inserter having automatic start up and shut down sequences to ensure proper document collation.

It is a still further object of the present invention to provide a multi-station document inserter with a diagnostic mode for access by a service technician.

It is a still further object of the present invention to provide a multi-station document inserter having a centralized control and display.

It is a still further object of the present invention to provide a multi-station document inserter which is user friendly.

It is a still further object of the present invention to provide a multi-station document inserter which is less dependant upon operator skill than known document inserters.

It is a still further object of the present invention to provide a multi-station document inserter which facilitates servicing.

It is a still further object of the present invention to provide a multi-station document inserter having a central control display which visually displays and describes inserter faults in human readable form.

It is a still further object of the present invention to provide a multi-station document inserter which permits reconfiguration by the operator.

It is a still further object of the present invention to provide a multi-station document inserter whose configuration and functions may be readily changed in the field.

It is a still further object of the present invention to provide a standardized reconfigurable multi-station document inserter which facilitates manufacture.

Briefly, in accordance with the present invention, a method and associated apparatus is disclosed for providing a universal multi-station document inserter, including the steps of providing a plurality of feeder stations for feeding documents in response to signals from a central processor, providing each feeder station with a unique address, storing feeder programs in distributed processors associated with the feeder stations which provide instructions to each feeder station for feeding documents storing a supervisory program in the central processor which is capable of providing address and command signals to the distributed processors of the feeder stations, and interconnecting the central processor and the distributed processors for the transmission of signals so that upon receipt of the proper address and command signals at the feeder stations, the feeder stations will undergo certain document feeding functions under control of the central processor in accordance with instructions programmed into the distributed processors associated therewith.

Other objects, aspects and advantages of the present invention will be apparent from the detailed description considered in conjunction with the preferred embodiment of the invention illustrated in the drawings, as follows:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a multi-station document inserter in accordance with the present invention;

FIGS. 2, 2*a*–2*b* are schematic diagrams of the layout of the feeder modules and circuits of the multi-station document inserter;

FIG. 3 is a block diagram of the electronic circuits used in the multi-station document inserter;

FIGS. 4, 4*a*–4*c* are schematic diagrams of the feeder interface circuit;

FIGS. 5, 5*a*–5*c* are schematic diagrams of the scanner interface circuit;

FIGS. 6, 6*a*–6*b* are schematic diagrams of the transport interface circuit;

FIGS. 7*a*–7*h*, 7*j*–7*h* are flow charts of the supervisory program for use in the supervisory control circuit;

FIGS. 8*a*–8*e* are flow charts of the feeder program for use in a high ratio feeder;

FIGS. 9*a*–9*e* are flow charts of the feeder program for use in a high speed feeder;

FIGS. 10*a*–10*e* are flow charts of the feeder program for use in an envelope feeder;

FIGS. 11*a*–11*f* are flow charts of the feeder program for use in a burster-folder; and

FIGS. 12*a*–12*h*, 12*j*–12*n*, 12*p*–12*r* are flow charts of the scanner program for use in the scanner interface circuits.

DETAILED DESCRIPTION

Referring to FIG. 1, a document inserter in accordance with the present invention is generally illustrated at 13. The document inserter 13 includes a plurality of serially arranged modules including an envelope feeder station or module 15 and six document feeder station or modules, including five feeder modules designated 14, 16, 18, 20, 22, and burster-folder station or module 24. A computer generated forms feeder 26 feeds continuous form control documents 27 having coded marks 28 thereon to the burster-folder 24 for separating and folding. The coded marks 28 on the control documents 27 are sensed by a control scanner 29. Thereafter, the serially arranged feeder stations 22, 20, 18, 16 and 14 sequentially feed the necessary documents onto the transport deck 30 at each station as the control document 27 arrives at the respective station to form a precisely collated stack of documents which is transported to the envelope feeder 15. Preferably, the transport deck 30 includes a ramp feed so that the control document always remains on the top of the stack of advancing documents. Such a transport deck is used in the INSERTAMAX III Mail Inserter available from Pitney Bowes, Inc. of Stamford, Conn. However, it should be understood that the transport deck may be of other types, such as that used in the INSERTAMAX II Mail Inserter available from Pitney Bowes, Inc., of Stamford, Conn. or the transport deck disclosed in U.S. Pat. No. 3,934,867, issued on Jan. 27, 1976, to Frank A. Oeschger, Jr. and assigned to Pitney Bowes, Inc.

The collated stack of documents is inserted in a envelope at the envelope station 15. The necessary postage is provided and the envelope is sealed by a postage meter 31, such as Pitney Bowes, Inc. Model 4255 Postage Meter. As desired, the completed envelopes may then be transported to a single or multi-level stacker 32. Details regarding the components of the feeder modules including the arrangement of the clutches, brakes, motors, and encoder therein may be obtained from U.S. Pat. No. 3,935,429, issued on Jan. 27, 1976, to George N. Braneky et al., entitled, PROCESS AND APPARATUS FOR CONTROLLING DOCUMENT FEEDING MACHINES FROM INDICIA CONTAINED ON A DOCUMENT FED THEREFROM and assigned to Pitney Bowes, Inc. of Stamford, Connecticut, the disclosure of which is incorporated herein by reference, and from the INSERTAMAX III Mail Inserter previously referenced.

The inserter 13 includes a central control display 34 which displays status messages and fault signals in human readable form and further enables the operator to control and change the configuration of the inserter 13 via finger touch switches, as will be described in more detail in copending patent application Ser. No. 394,386 filed on July 1, 1982 in the names of Peter N. Piotroski and John M. Gomes, entitled, USER FRIENDLY CENTRAL CONTROL DISPLAY FOR A MULTI-STATION DOCUMENT INSERTER.

Referring to FIG. 2, the layout of the feeder modules and circuits of the document inserter 13 is illustrated. This document inserter is designated 40. It is a similar to the document inserter shown in FIG. 1, but shows the modular arrangement of feeder modules having a varying number of feeder modules between 4 and 12, as desired. A main chassis 42 includes 4 or 6 document feeder stations, excluding the envelope feeder 48. An intermediate module 44 includes 4 document feeder stations and an end module 46 also includes 4 feeder stations.

The electronic circuits of the multi-station document inserter 40 are arranged such that the intermediate module 44 may be readily electrically coupled to the main chassis 42 which includes 4 or 6 feeder stations as desired. The end module 46 may also be readily electrically coupled to the intermediate module 44 as desired. Thus, it is apparent from FIG. 2, that the inserter 40 may include 4,6,8,10, or 12 document feeder stations, excluding the envelope feeder station 48, in accordance with customer requirements. The feeder stations 1–12 are designated 50–76 beginning with the feeder station 50 closest to the envelope feeder 48 and ending with the most remote feeder station 76, which is the control document feeder station.

All the document feeder stations 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 74, and 76 are arranged in line to serially feed documents therefrom to form collated stacks with the coded documents 27 (see FIG. 1) for insertion into envelopes at envelope station 48. After being placed in an envelope and transported to an accessory station, the envelope is imprinted with the proper postage and sealed by a postage meter 78. A second postage meter 80 may be provided and used for a Postage Break if the documents in the envelope exceed a predetermined number indicating additional postage is necessary. Additional accessories such as multi-level power stackers for rejection of incomplete collations and for sorting various completed collation may be provided, e.g., by levels 82, 84, 86, 88, 90, 92, and 94.

The feeder stations 48 through 76 are arranged in parallel between a signal bus 96 and a power bus 98 so that each of the feeder stations 48 through 76 has a unique address code in the signal bus 96. Further, the feeder station 76 most remote from the envelope feeder station 48, which is normally but not necessarily a burster/folder, includes a control scanner interface circuit which will be described in more detail with reference to FIG. 5. Advantageously, any scanning multi-document feeder may be used in this position to feed a control document. The other feeder stations will also typically include a scanner interface circuit to provide additional control. Further, each feeder module 48–76 will include a feeder interface circuit which will be described in more detail with reference to FIG. 4. Advantageously, the scanner and feeder interface circuits for each feeder module are physically the same. This is highly advantageous in providing a universal multi-station document inserter with intelligence present at each feeder/scanner module capable of carrying out certain feeding/scanning operations in response to a central control command.

Further, as seen in FIG. 2, a supervisory control circuit 100 is electrically coupled to the signal bus 96 and to a transport interface circuit 102. A power supply 104 is coupled to the power bus 98, the supervisory control circuit 100 and to the transport interface circuit 102. The feeder interface circuits and scanner interface circuits in the feeder modules 50–76 are arranged in parallel between the signal bus 96 and the power bus 98. Also coupled to the signal bus 96 and power bus 98 is an accessory interface circuit 105. In response to signals from the supervisory control circuit 100, the accessory

interface circuit 105 provides output signals to various accessories such as postage meters 78 and 80, and the multi-level power stackers 82, 84–94. Coupled to the supervisory control circuit 100 is the central control display 34, see also FIG. 1.

The supervisory control circuit or central microprocessor 100 includes a single board computer, such as National BLC 20-4 available from National Semiconductor Corporation, or other similar single board computer available from Intel Corporation, and an auxiliary memory board such as National BLC 104 available from National Semiconductor Corporation, or other similar auxiliary memory board. The single board microcomputer and auxiliary memory board include plug in sockets for receiving PROMS. A supervisory program capable of running all the devices of the inserter 40 and performing all defined control functions is stored in the plug-in PROMS, which are plugged into the single board microcomputer and the auxiliary memory board. The program listing for the supervisory program is set forth in the accompanying Microficher Appendix. An additional PROM, a configuration PROM, includes a data table which specifies a particular inserter configuration and the functions to be performed for that configuration by the executable routines in the supervisory program. Suitable PROMS are Type 2716, available from National Semiconductor Corporation. The details of generating a configuration PROM for use in the universal multi-station document inserter of the present invention are found in copending patent application Ser. No. 394,385, filed on July 1, 1982 in the name of Peter N. Piotroski and John M. Gomes entitled, METHOD AND APPARATUS FOR CUSTOMIZING A MULTI-STATION DOCUMENT INSERTER.

By using the foregoing format for the supervisory control circuit or central microprocessor 100, there is no need to change any of the executable programs. Thus, the same supervisory program may be incorporated into the supervisory control circuit 100 of each multi-station document inserter. The configuration PROM contains no executable programs, but only a table of data which specifies the particular routines to be executed to provide the desired functions for a particular document inserter. The tables of data in the configuration PROM are provided from customer responses to a series of questions regarding the inserter configuration and the functions to be performed thereby. The program for the configuration PROM is set forth in the accompanying Microfiche Appendix in PASCAL language. During operation, the software of the supervisory program will access the data tables in the configuration PROM to determine which routines of the supervisory program are to be executed.

To facilitate understanding of the operation of the software in the central microprocessor 100, as set forth in the flow chart 101 in FIG. 7 and the supervisory program and configuration PROM program set forth in the accompanying Microfiche Appendix, the movement of a control document from a burster/folder to the power stacker will be described. However, we will confine our description to a four feeder station document inserter 50,52,54 and 56 with envelope feeder 48, see the main chassis in FIG. 2., and with feeder station 56 being a burster/folder, such as in FIG. 1. Further it is assumed that feeder stations 50 and 52 are high speed feeders and feeder station 54 is a standard feeder. During power up of the document inserter 40, the data table in the configuration PROM is copied into the RAM of the central processor 100. The software in the central microprocessor 100 initially ascertains from the RAM what types of document codes to expect and what their values will be. In this respect, the configuration PROM includes a data table subdivided into blocks of data or space allocated therefore for the maximum number of feeder station or module locations. Thus, the blocks of data in the data table will map the feeder module locations to their position along the document transport path. The software of the supervisory program first starts at the beginning of the block of data associated with feeder station 1, and reads through the data block to see what type of feeder is being used and what type of functions it is to perform. It then proceeds to the next data block associated with feeder station 2 and reads through the data block to see what type of feeder is being used and what type of functions it is to perform. The software continues on in this fashion until it reaches a special End of Table Code for the particular inserter configuration.

For example, the configuration PROM will include a yes/no flag for each feature, such as selective feeding, match verification, selective metering, etc. Associated with each of these features will be a set of data values corresponding to the information necessary to implement the task. In this case, only the count verification and selective feeding flags are on, and all others are off. The address codes are predetermined. The selective feeding flag will include these data values as well as the data values of the bar codes which control the selective feeding feature. There are four possible values: 1. No Feed. 2. Feed from feeder one only. 3. Feed from feeder two only. 4. Feed from both feeders.

At the end of the cycle which moved the control document through the burster/folder 56 the codes on the document will have been read by the scanner interface circuit and made available to the central microprocessor 100. The codes will be stored by the central microprocessor 100 to be used in a later cycle to select the appropriate feeder (s) as described by the code. Along with the selective feeding code is the value of the count of the number of documents to be fed by the selected feeder.

During the next inserter cycle, the control document is moved along the transport deck to the next station of the inserter, and the internal document table in the RAM is updated to reflect that the control document is in the next position. The RAM is then checked to see what feeder module is in that position. Since it is a standard feeder 54, the only Command from the supervisory control circuit 100 is feed. The standard feeder 54 then feeds a single document. At the end of this feed cycle, the feeder status is checked for paper jams or other faults. If there are no faults, another cycle begins and the control document is moved to the high speed feeder 52.

When the document moves on to the next position, the RAM indicates that it is a high speed feeder 52, and provides its address code. The central microprocessor 100 then checks the document table to see what code was read from the control document feeder scanner and checks it against the code definitions in the RAM. Assuming that the code was only feed feeder one, a feed Command is not issued from the central microprocessor 100 to feeder two 52. Another cycle takes place moving the document to the next high speed feeder 50. The code stored in the central processor 100 now issues a

feed command along with the desired number of documents to be fed from feeder 50. When finished, the central microprocessor 100 issues a Send Count Command to the feeder 50. The feeder 50 will return a count of the documents it has fed to the central microprocessor 100. The central microprocessor 100 will then check this count against the count for the document stored in the document data table. If they match, no action is taken but if there is a fault it will be recorded in the document data table in the RAM. The configuration PROM and RAM also contain fault handling codes which the microprocessor 100 will use to determine what to do with the document.

During the next cycle the transport deck moves the stack of collated documents, including the coded document, to the envelope feeder 48 and the stack of collated documents is inserted into an envelope. During the next cycle the transport deck moves the envelope to the postage meter 78 where the necessary postage is applied and the envelope is sealed. During the final cycle the sealed envelope is feed to the stackers 82, 86, 88, 90, 92, or 94.

The aforementioned actions occur for the control document at each feeder module every cycle. For example, in a twelve station inserter, references to the RAM, a decision based upon those references, and an update of the document table in the RAM is made for each of the twelve stations every cycle. Specifically, as the supervisory program progresses from feeder station to feeder station, it reads the data table in the RAM, which is a reflection of the configuration PROM, except insofar as the inserter configuration may have been reconfigured by the operator as described more fully below and in the aforementioned patent application Ser. No. 394,385 of Peter N. Piotroski et al.

The supervisory program resident in the central microprocessor 100 describes a maximum inserter configuration. The actual configuration of the inserter 40 is a subset of the maximum configuration. In implementing the supervisory program, the maximum inserter configuration is translated into software routines, each of which implements a small portion of the maximum inserter configuration.

Interactive communication is maintained between the central microprocessor 100 and the central control display 34 through an RS232C standard communication line 106. During normal inserter operation, or in response to operator actuation of the central control display 34, the central microprocessor 100 accesses all of the feeder modules or stations, including high ratio document feeders, high speed document feeders, standard document feeders, inserters, burster-folders, folder-feeders, divider page extractors, envelope deflectors, envelope markers, and the accessory interface circuit 105 for postage meters and/or single of multi-level stackers. Illustratively, the programs for a high ratio feeder and a high speed feeder are set forth in the accompanying Microfiche Appendix.

Initially, the central microprocessor 100 communicates with the control scanner interface circuit of the burster-folder 24 to supply the proper dash codes to the scanner interface circuit to program the same in accordance with the program for the scanner interface circuit set forth in the accompanying Microfiche Appendix. Thereafter, the scanner interface circuits associated with the feeder stations or modules scan the documents being fed thereby.

Referring to FIG. 3 a block diagram of the interconnection of the interface circuits for the multi-station document inserter 40 is illustrated. The supervisory control circuit or central microprocessor 100 interacts directly with transport interface circuit 102 to activate the transport motor, clutch and brake, as well as receive pulses from the encoder 198 see FIG. 2, for control of the transport deck 30, see FIG. 1. Interactive communication between the supervisory control circuit 100 and the central control display 34 is provided over the standard communication line 106. Advantageously, the central control display 34 may be a finger touch display switch, such as Fluke Model 1780A InfoTouch Display. Communication between the supervisory control circuit 100 and the feeder interface circuit 110B (documents) and envelope interface circuit 110A (envelopes) and accessory interface circuit 105 is maintained over the signal bus 96. Additionally, the supervisory control circuit 100 communicates with the scanner interface circuits 160 through the signal bus 96. The scanner interface circuit 160 also communicates with the feeder interface circuit 110B. The scanner interface circuit 160 will be described in more detail with reference to FIG. 5.

Referring to FIG. 4 a universal feeder circuit for use with all the feeder interface circuits 110A and B shown in FIG. 3 is illustrated generally as 110. The flow chart of the program for a high ratio feeder is illustrated in FIG. 8 as 103; the flow chart of the program for a high speed feeder is illustrated in FIG. 9 as 105; the flow chart of the program for the envelope feeder is illustrated in FIG. 10 as 107; and the flow chart of the program for a burster-folder is illustrated in FIG. 11 as 109. The program listings for the aforementioned feeders are set forth in the accompanying Microfiche Appendix. The feeder interface circuit 110 is the same for each feeder station 48–76, except that the address code of each feeder station is unique. This is accomplished via a thumbwheel switch 112 which is preset with a unique address code for each feeder station. This unique address code is supplied to a first set of inputs 114 to a comparator 116. The comparator 116 receives address data on a second set of inputs 118 from the central microprocessor 100 over signal bus 96. If there is a coincidence between the unique address and address data, the comparator 116 will provide an output signal to microprocessor 120 and one-shot circuit 123. When the one-shot circuit 123 receives a signal from the comparator 116, the one-shot circuit 123 provides an internal transfer acknowledge timing signal to the central microprocess 100 which indicates that the feeder module has received data therefrom. The output signal from comparator 116 activates the CS (Chip Select) input of the microprocessor 120 which activates the microprocessor 120. The microprocessor 120 also receives inputs on input lines 122 from photocells and/or switches (not shown) and in response thereto transmits output signals to output lines 124 for performing certain functions at the feeder station in accordance with the program stored therein. As seen in FIG. 4, this includes actuation of motors, clutches, brakes, fault lights, and solenoids associated with that feeder station. The microprocessor 120 also transmits a start scan signal 126 to its associated scanner interface circuit which will be described in more detail with reference to FIG. 5.

The microprocessor 120 transmits output data on data lines 128 to the central microprocessor 100 over signal bus 96 to advise the central processor 100 of the

functions implemented by the feeder module being accessed and to store the data for the document in the document table in the RAM of the central processor 100. Additionally, the microprocessor 120 also receives its feed function data from the central microprocessor 100 over the same data lines 128. Specifically, the data from the central processor 100 is read and written into the microprocessor 120 over memory write and memory read lines 130 and 132, respectively.

As apparent from FIGS. 8–11 and the accompanying program listing in the Microfiche Appendix, each different type of feeder will have a different program which is implemented by a resident or distributed processor 120. Advantageously, with such an arrangement there is intelligence present at each feeder module so that the Commands from the supervisory program are essentially a Feed Command with the individual feeder modules being responsive thereto to perform their feeding functions. This facilitates a standard supervisory program format which is usable with individually programmed feeder modules to readily provide a customized inserter without requiring any reprogramming. Additional details regarding the feeder interface circuit may be obtained from copending patent application Ser. No. 394,383 filed on July 1, 1982 in the names of Peter N. Piotroski and John M. Gomes, entitled, FEEDER INTERFACE CIRCUIT FOR UNIVERSAL MULTI-STATION DOCUMENT INSERTER.

Referring to FIG. 5, the scanner interface circuit 160 for the optional scanner interface circuit illustrated in FIG. 2 and the scanners for the feeder modules shown in FIG. 1, is illustrated. The flow chart of the program for the scanner interface circuit 160 is illustrated in FIG. 12 as 150. The program listing therefore is set forth in the accompanying Microfiche Appendix. The scanner interface circuit 160 employs a portion of the address code of its associated feeder interface circuit 110 and receives this unique address code over address leads 161 coupled to the thumbwheel switch 112 of its associated feeder interface circuit 110. A comparator 162 receives the remaining address from the central processor 100 over the signal bus 96 comprising a first set of inputs 164 and the address leads 161 comprising a second set of inputs 161 and provides an output signal on lead 166 when there is a coincidence therebetween. The presence of a signal on lead 166 causes a signal to be applied to port CS (Chip Select) which activates the distributed microprocessor 168. Further, the presence of a signal on lead 166 also activates one-shot circuit 169 to provide internal transfer acknowledge signal to the central processor 100 which indicates that the distributed microprocessor 168 has received data from the central processor 100. The central processor 100 transfers data through data leads 170 to program the microprocessor 168. A port expander 172, such as Type 8243 available from Intel Corp., is coupled to the microprocessor 168 over leads 174. The input leads 175 of the port expander 172 are coupled to photocells (not shown) for reading the dash codes present on the coded documents. The programmed microprocessor 168 and port expander 172 program a first programmable counter 176 and a second programmable counter 178 in accordance with the data read over data lines 170 from the central processor 100, to provide timing signals to the microprocessor 168 and port expander 172 for reading the dash codes through input leads 175. Output data from the microprocessor 168 is applied over leads 180 to corresponding input ports of the programmable counters 176 and 178. Further, input signals are also provided to the programmable counters 176 and 178 from output ports of the port expander 172 and scanner encoder (not shown) on leads 182 and 184, respectively, to the programmable counters 176 and 178 to monitor how far the coded document has traveled per each preset increment of paper travel. In addition to providing output signals 180 to the programmable counters 176 and 178, the feeder microprocessor 120 (see FIG. 4) provides a start scan signal thereto. The programmable counters 176 and 178 are provided so that different discrete areas on a document may be selectively scanned skipping intermediate areas, as desired. Each programmable counter 176 and 178 includes port groupings, 0, 1, and 2. Port grouping 0 provides information for setting the photocells to begin scanning at a predetermined distance from the edge (top or bottom) of a document. Port grouping 1 provides a predetermined distance for scanning after reaching the point where scanning commences. That is, the port 1 grouping opens up a "window" where the photocells begin scanning for the first dash of the dash code to set up timing for the subsequent dashes. Port grouping 2 specifies a predetermined distance by which the individual dashes of the dash codes on the documents may be separated. For example, the programmable counter 176 may be set to begin counting 4 four inches from the bottom of the document and the programmable counter 178 may be set to begin counting 8 inches from the bottom of the document, thereby scanning separate and discrete areas of the coded documents.

The output signals from the programmable counters 176 and 178 and Select signal from port expander 172 are transmitted to a multiplexer 184 which supplies input signals to the microprocessor 168 for selecting the next scanning zone and the next scanning sequence for the microprocessor 168. Encoder signals are provided to the programmable counters 176 and 178. Additional details regarding the scanner interface circuit may be obtained from copending patent application Ser. No. 394,390, filed on July 1, 1982 in the names of Peter N. Piotroski and Robert K. Gottlieb, entitled SCANNER INTERFACE CIRCUIT FOR UNIVERSAL MULTI-STATION DOCUMENT INSERTER.

Referring to FIG. 6, the transport interface circuit 102 is illustrated in detail. The transport interface circuit 102 receives input signals from the central processor 100 over leads 204 and converts the signals to high level voltage signals to drive various inserter devices. The transport encoder is interfaced to central processor 100 through line receivers. The transport interface circuit 102 supplies a D.C. voltage to the battery 192, see FIG. 2, which is used to maintain data storage in the RAM of the central processor 100 for a predetermined period should there be a power failure. Encoder channel signals and encoder marker signals are received on leads 194 and 196, respectively, from the transport encoder 198, see FIG. 2. Power is provided to the transport interface circuit 102 from power supply 104.

The transport interface circuit 102 includes logic circuitry including LEDS 200 and gates 202. The gates 202 provide override signals to output leads 206 in conjunction with signals received on data leads 204 from the central processor 100. The output leads 206 provides signals to drive the various devices, such as the clutch, motor, and brake of the transport deck and set certain LEDS 200 which provide visual indicators that the appropriate signals have been output. Additional details regarding the transport interface circuit may be

obtained from copending patent application Ser. No. 394,387 filed on July 1, 1982 in the names of Peter N. Piotroski and John M. Gomes, entitled, TRANSPORT INTERFACE CIRCUIT FOR UNIVERSAL MULTI-STATION DOCUMENT INSERTER.

Referring to FIG. 2, the accessory interface circuit 105 receives input signals from the signal bus 96 and power bus 98 and provides output signals to activate various accessories, such as postage meters 78 and 80, a rotatable envelope table, and power stackers 82 through 94.

To commence inserter operation, an on/off key switch is activated with the key being removable in the "off" position. The operator then starts the inserter 40 by first selecting a Continuous or One-Cycle switch and then activating a Sequence Start switch on the central control display 34. When its Sequence Start switch is activated, the central processor 100 sends a Command to activate the last feeder module 76. That is, the feeder module 76 most remote from the envelope feeder 48 is activated to feed the required number of documents. The next feeder module 74 in sequence is then activated on Command from the central processor 100 and the documents are fed from this feeder 74. Document feeding continues, sequentially in this fashion from one feeder module to the next to provide a complete collation of documents at the envelope feeder 48. It should be understood that the control document scanner of feeder module 76 is initialized during power up of the inserter as will be described in more detail below.

In contrast, when the inserter is to be shut down, the operator activates a Clear Deck switch on the central control display 34 and the same process which occurred with the Sequence Start sequence is repeated, with the exception that the feeder station 76 most remote from the envelope feeder 48 is deactivated after feeding the desired documents and then feeders 74–50 are deactivated sequentially to provide a complete collation of documents at the envelope feeder 48 for insertion therein to insure that a partial collation of documents is not left on the transport deck of the document inserter. Operation of the inserter 40 then ceases. Further details regarding the Sequence Start and Clear Deck (Sequence Stop) Modes can be obtained from copending application Ser. No. 394,389, filed on July 1, 1982, in the name of Peter N. Piotroski, entitled, MULTI-STATION DOCUMENT INSERTER WITH AUTOMATIC START UP AND SHUT DOWN DOCUMENT COLLATION SEQUENCES.

After the Sequence Start cycle is completed, the inserter 40 continues its operation. If the operator chooses, he/she can skip the Sequence Start cycle and activate a Start Transport switch which places the inserter 40 in a non-sequence run mode. With either approach, the scanner interface circuit 160 of the control document feeder 76, the last feeder in FIG. 2, reads the dash code marks on the document and transmits them to the central processor 100. During initialization of the scanner interface circuit 160 by the central processor 100, the scanner interface circuit 160 is programmed with the appropriate scanner timing for reading the codes in accordance therewith. The central processor 100 then transmits the address code and Feed Command to the associated feeder module 76. However, as apparent from the accompanying flow chart 101 in FIG. 7, it should be understood that the Feed Command may include signals other than simply feed, such as among others, feed more than one, the number of documents fed, Initialize, and Diagnostic Mode. The feeder module 76 then feeds the required documents in accordance with the feeder program stored therein for that particular type of feeder module. When the scanner interface circuit 160 determines that the last document for that particular collation package has been fed from feeder 76, the scanner interface circuit 160 transmits an End of Collation signal to the feeder interface circuit 110 which ceases document feeding at that station. The document (s) fed from feeder station 76 are then transported along the transport deck to the next feeder station 74. With this process being repeated from station to station so that a properly collated stack of documents arrives at the envelope feeder 48.

Advantageously, the transport deck may include an inclined ramp so that the coded control document (address) is fed up a ramp and placed on top of documents from the downstream stations. At each station the previously fed stack of documents is fed up a ramp and placed on top of the documents fed from the adjacent downstream station, so that all the documents arrive at the envelope feeder 48 with the coded control document on top to facilitate stuffing into an envelope with the address showing through the window of the envelope, such as used in the INSERTAMAX III Mail Inserter available from Pitney Bowes, Inc. of Stamford, Connecticut. However, it should be clearly understood that the transport deck may assume other forms such as a chain drive transport deck such as disclosed in INSERTAMAX II Mail Inserter available from Pitney Bowes, Inc. of Stamford, Connecticut. This transport deck does not include ramps, but simply transport the coded control document to the next feeder station. When the control document is registered therewith, the feeder module feeds the required documents on top of the coded control document. The partially complete stack of documents is moved to the next feeder station and the required documents are then fed therefrom. With such a transport deck the coded control document arrives at the envelope feeder module 48 at the bottom of the collated stack of documents.

The transport encoder 198 provides pulses representing an increment of document travel along the document transport deck or path. The transport encoder 198 communicates these pulses to the central processor 100 which keeps track of the pulse count. The central processor 100 keeps track of the encoder count and issues a Feed Command to the appropriate feeder module when the appropriate count is reached. This count may be the same for all feeder modules or it may vary, as desired.

Any error conditions in the document feed are transmitted from the feeder interface circuit 110 for the particular feeder station to the central processor 100 for display on the central control display 34, describing to the operator the fault location and a description thereof in human readable form.

After the document feeding at each feeder module is complete, the data representing the document is transmitted to the central processor 100 and stored in the RAM, updating the data table representing that document.

Further, as apparent from the supervisory program listing in the accompanying Microfiche Appendix, and the flow chart 101 in FIG. 7, the document inserter 40 includes a Diagnostic Mode for implementation by a service technician. Advantageously, a particular access code known only to the service technician is provided for the Diagnostic Mode. When this code is accessed

through the central control display 34, various components of the feeder stations are exercised to determine their operating status. When appropriate, the service technician can modify the state of a particular feeder station to verify a function in order to help him/her determine if a particular malfunction is occurring. For example, during the Diagnostic Mode, the central control display 34 will indicate the state of all the input devices such as switches, photocells, and display switch means and activate the output devices such as motors, clutches, brakes and lights either individually or sequentially. Further, an indicator may be provided to verify that the central processor 100 is communicating properly with various feeder modules or stations. The scanner encoders at the individual feeder modules are also monitored. Advantageously, the central processor 100 and central control display 34 maintain the feeder functions and display the encoder count while a handcrank is actuated. Further, the ability to trace a signal generated by coded dash mark or hole to a designated output device when in the static or handcrank mode is provided. Finally, when in the Diagnostic Mode the central processor 100 and display 34 provide the ability to set or change the feed time of a particular feeder station. Additional details regarding the Diagnostic Mode can be obtained from copending patent application Ser. No. 394,384 filed on July 1, 1982 in the names of Peter N. Piotroski and John M. Gomes entitled DIAGNOSTIC MODE FOR A MULTI-STATION DOCUMENT INSERTER.

Further, the operator may change or reconfigure the supervisory control circuit 100 by activating certain switches of the central control display 34 so that mirror image of the data table in the configuration PROM which is present in the RAM is changed. D.C. battery back up is provided to retain the changed information in the RAM during power failure. The RAM of the central processor 100 also stores the information representing the original data table for recapture should the operator or service technician desire to reset the inserter to its original operating condition. Further, details of the central control display and the ability of the operator to reconfigure the inserter through such display is found in the aforementioned copending patent application Ser. No. 394,386, entitled USER FRIENDLY CENTRAL CONTROL DISPLAY FOR A MULTI-STATION DOCUMENT INSERTER.

It should be understood by those skilled in the art that various modifications may be made in the present invention without departing from the spirit and scope thereof, as described in the specification and defined in the appended claims.

What is claimed is:

1. A method for providing a universal multistation document inserter for inserting documents into an envelope, including the steps of:

providing a central processor;

providing a plurality of modular feeder stations for feeding documents in response to signals from the central processor;

providing each feeder station with a unique address;

storing predetermined feeder programs in distributed processors associated, respectively, with each of the modular feeder stations, each of the feeder programs providing instructions to the associated feeder station for feeding documents;

storing a supervisory program in the central processor operative for providing address and command signals to the distributed processors of the feeder stations;

interconnecting the central processor and the distributed processors for the communication of signals so that upon receipt of the proper address and command signals at a particular distributed processor, the associated feeder station will execute its document feeding functions under control of the central processor in accordance with instructions programmed in the distributed processor;

transporting a coded document from feeder station to feeder station; and

scanning the coded document and inputting the coded information to the central processor for controlling the operation of each feeder station.

2. The method recited in claim 1, including the step of:

communicating end of collation signals to the feeder stations in response to the codes on the coded documents.

3. The method recited in claim 1, wherein the step of storing a supervisory program comprises:

storing the supervisory program in a plurality of PROMS, one PROM of which includes a data table that specifies a particular inserter configuration and the functions to be performed for that inserter configuration.

4. The method recited in claim 1, including the step of:

scanning for the presence of a coded document at each feeder station of said plurality of feeder stations to provide input data to the central processor regarding the status of the coded document.

5. The method recited in claim 1, including the step of:

converting output signals from the central processor to high level voltage signals for actuating a means for transporting documents from one feeder station of said plurality of feeder stations to the next feeder station.

6. The method recited in claim 1, including the step of:

sequentially actuating feeder stations and feeding documents from feeder station to feeder station beginning with the last feeder station during a Sequence Start Mode to ensure a complete initial collation of documents to be fed from the feeder stations.

7. The method recited in claim 1, including the step of:

sequentially deactivating the feeder stations one by one beginning with the last feeder station during a Sequence Stop Mode to ensure that a partial collation of documents is not left in a feeder station of the document inserter.

8. The method recited in claim 1, including the step of:

accessing the central processor to provide a Diagnostic Mode and a visual display associated with said Diagnostic Mode.

9. The method recited in claim 1, including the step of:

displaying fault signals indicating the location of the fault and providing a description thereof in human readable form.

10. The method recited in claim 1, including the step of:

changing the configuration of the document inserter by instructions submitted to the central processor by the inserter operator.

11. The method recited in claim 10, including the steps of:

retaining for reference the initial central processor configuration when changes are made; and

displaying the initial central processor configuration when requested.

12. The method recited in claim 1, wherein:

the central processor is interconnected to the distributed processors through a signal bus and provides unique address codes for the distributed processors.

13. A method for providing a universal multistation document inserter, comprising the steps of:

providing a central processor;

providing a plurality of feeder stations for feeding documents in response to control signals from the central processor;

providing each feeder station with a unique address;

storing predetermined feeder programs in distributed processors associated, respectively, with each of the feeder stations, each of the feeder programs providing instructions to each associated feeder station for feeding documents in response to control signals from the central processor;

storing a supervisory program in the central processor which is operative for providing address and command signals to the distributed processors of the feeder stations;

interconnecting the central processor and the distributed processors for the communication of signals so that upon receipt of the proper address and command signals at a particular distributed processor, the associated feeder station will execute its document feeding functions under control of the central processor in accordance with the instructions programmed into the distributed processor;

scanning coded control documents to provide input signals to the central processor upon detection of predetermined document codes; and

converting output signals from the central processor to high level voltage signals for actuating document transport devices associated with the document inserter.

14. The method recited in claim 13, including the steps of;

sequentially feeding coded documents from one feeder station to another;

feeding documents from a feeder station in response to command signals from the central processor.

15. The method recited in claim 13, including the step of:

accessing the supervisory program to provide a Diagnostic Mode for servicing the inserter.

16. The method recited in claim 13, including the steps of:

changing the configuration of the inserter by instructions submitted to the central processor by the inserter operator.

17. The method recited in claim 16, including the steps of:

retaining for reference the original inserter configuration in the central processor after the configuration has been changed by the operator; and

displaying the initial programmed configuration when requested.

18. A method of providing a universal multistation document inserter, including the steps of:

providing a plurality of feeder stations for feeding documents in response to signals from a central processor;

storing a supervisory program including a data table in the central processor which includes information on the type of feeder stations and the function to be performed thereby;

scanning documents for a document code;

providing a signal indicative of the presence of a coded document to a central processor;

providing a unique address for each feeder station;

accessing the data table stored in the central processor to determine the type of feeder station present at each feeder station location and the function to be performed thereby;

transmitting to said plurality of feeder stations a command signal from the central processor including the unique address of a particular feeder station;

feeding a document from said particular feeder station in response to the command signal; and

updating the data table in the central processor after the feeder station has fed the document to include data as to the status of a coded document.

19. The method recited in claim 18, wherein:

the steps of accessing, feeding, and updating are undertaken for each feeder station during each cycle of operation of the inserter.

20. A universal multi-station document inserter, comprising:

a plurality of feeder means arranged to feed documents;

address means associated with each of said feeder means to specify a unique address for each of said feeder means;

distributed processor means associated with each of said feeder means;

scanner means for detecting the presence of a predetermined code on a coded document; and

central processor means interconnected to said scanner means and said distributed processor means for activating said distributed processor means in response to a signal from said scanner means, which signal indicates the presence of a coded document having the predetermined code.

21. The universal multi-station document inserter recited in claim 20, including:

means for receiving address data specifying a unique address for each of said feeder means;

comparator means for comparing the data received by said means for receiving data with the unique address specified by said address means to provide an acknowledge signal when there is a coincidence therebetween.

22. The universal multi-station document inserter recited in claim 20, including:

means for reading data from said central processor means in response to a transfer acknowledge signal;

said central processor means issuing a feed command to said feed means in accordance with data stored therein; and

means for updating the data in said central processor means in response to the actions of said feeder means.

23. A universal multi-station document inserter, including:

a plurality of feeder stations for feeding documents;

distributed processor means associated with each of said feeder stations for feeding documents in accordance with feeder programs stored therein;

address means associated with each of said feeder stations for providing a unique address thereto;

central processor means electrically coupled to said distributed processor means for interaction therewith to initiate the feeding of documents by said feeder stations; and

scanner means electrically coupled to said central processor and said feeder stations for providing signals in correspondence with the coded documents at said feeder stations.

24. The universal multi-station document inserter recited in claim 23, wherein:

said central processor means includes PROM means programmed to supervise the feeding of documents by said feeder stations.

25. The universal multi-station document inserter recited in claim 24, wherein:

said PROM means includes a configuration PROM means including data which configures the inserter operation in accordance with desired user functions.

26. The universal multi-station document inserter recited in claim 25, wherein:

said central processor means includes RAM means for storing the data present in said configuration PROM means;

switch means for enabling the operator to reconfigure said RAM means;

display means for displaying the original inserter configuration present in said configuration PROM means.

27. The universal multi-station document inserter recited in claim 23, wherein:

said scanner means provide end of collation signals to said feeder stations.

28. The multi-station document inserter recited in claim 23, wherein:

said feeder stations are constructed in modules for interconnection to provide the desired number of feeder stations.

29. The universal multi-station document inserter system recited in claim 23, wherein:

said feeder stations are connected in parallel between a signal bus and a power bus;

said central processor is electrically coupled to said signal bus;

said power bus is electrically coupled to a power supply.

30. The universal multi-station document inserter recited in claim 29, including:

transport means electrically coupled to a power supply and said central processor for converting low level voltage signals from said central processor to high level voltage signals for driving document transport devices of the document inserter.

31. The multi-station document inserter recited in claim 23, including:

display means for displaying the location and a description of any faults present in the inserter in human readable form.

32. A universal multi-station document inserter, including:

a plurality of feeder stations arranged to feed documents;

distributed processor means associated with each of said feeder stations;

supervisory control means electrically coupled to said distributed processor means;

scanner means electrically coupled to said supervisory control means;

said supervisory control means being programmed to interact with said feeder stations in accordance with certain predetermined operating conditions desired by a user; and

said supervisory control means including first PROM means programmed with a maximum set of defined inserter configurations and functions and a second PROM means configured to interact with the program of said first PROM means to select a subset of the maximum set of defined inserter configurations and functions to operate the document inserter in accordance with desired customer requirements.

33. The multi-station document inserter recited in claim 32, wherein:

said feeder stations are connected in parallel between a signal bus and a power bus;

said supervisory control means is electrically coupled to said signal bus;

said power bus is electrically coupled to a power supply; and

a transport interface means is electrically coupled to said power supply and said supervisory control means for converting low level voltage signals from said supervisory control means to high level voltage signals for driving document transport devices associated with the document inserter.

34. The multi-station document inserter recited in claim 33, including:

accessory interface means responsive to signals from said power bus and signal bus for activating accessories.

* * * * *

US006105340A

United States Patent [19]

Draghetti

[11] **Patent Number: 6,105,340**

[45] **Date of Patent: Aug. 22, 2000**

[54] **METHOD OF FASHIONING PACKETS OF CIGARETTES AND EQUIPMENT FOR THE IMPLEMENTATION OF SUCH A METHOD**

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[73] Assignee: **G.D S.p.A.**, Bologna, Italy

[21] Appl. No.: **09/294,909**

[22] Filed: **Apr. 20, 1999**

[30] **Foreign Application Priority Data**

Apr. 22, 1998 [IT] Italy BO98A0255

[51] **Int. Cl.**[7] **B65B 61/20**

[52] **U.S. Cl.** **53/415**; 53/136.1; 53/157; 53/170; 53/445; 53/449

[58] **Field of Search** 53/136.1, 136.3, 53/157, 170, 415, 445, 449

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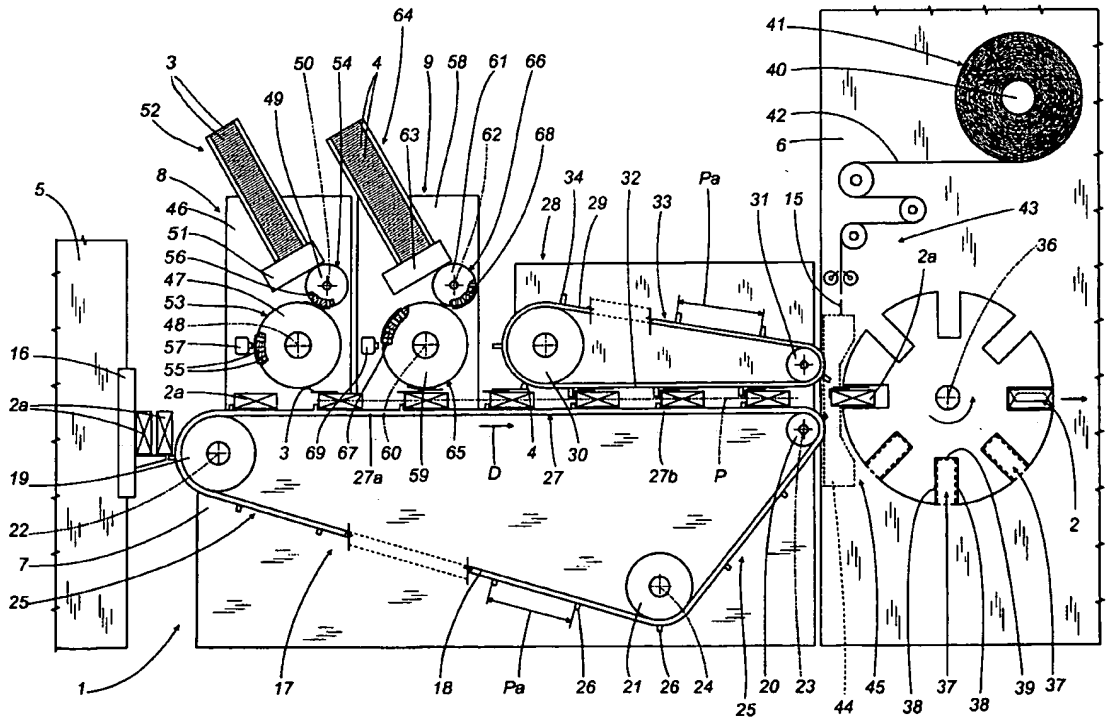
Primary Examiner—Daniel B. Moon
Attorney, Agent, or Firm—Pillsbury Madison & Sutro LLP

[57] **ABSTRACT**

Unsealed packets of cigarettes emerging from a packaging machine present an outer surface that consists of an opaque wrapping material, to which a revenue stamp and a coupon are affixed as the packets are transferred directly and in an ordered succession from the packaging machine to a cellophaner; on reaching the cellophaner, each packet in turn is enveloped in a sheet of transparent overwrapping material covering the opaque wrapping material, the revenue stamp and the coupon, and the overwrapping sealed in such a way that the finished packet will remain substantially airtight

14 Claims, 3 Drawing Sheets



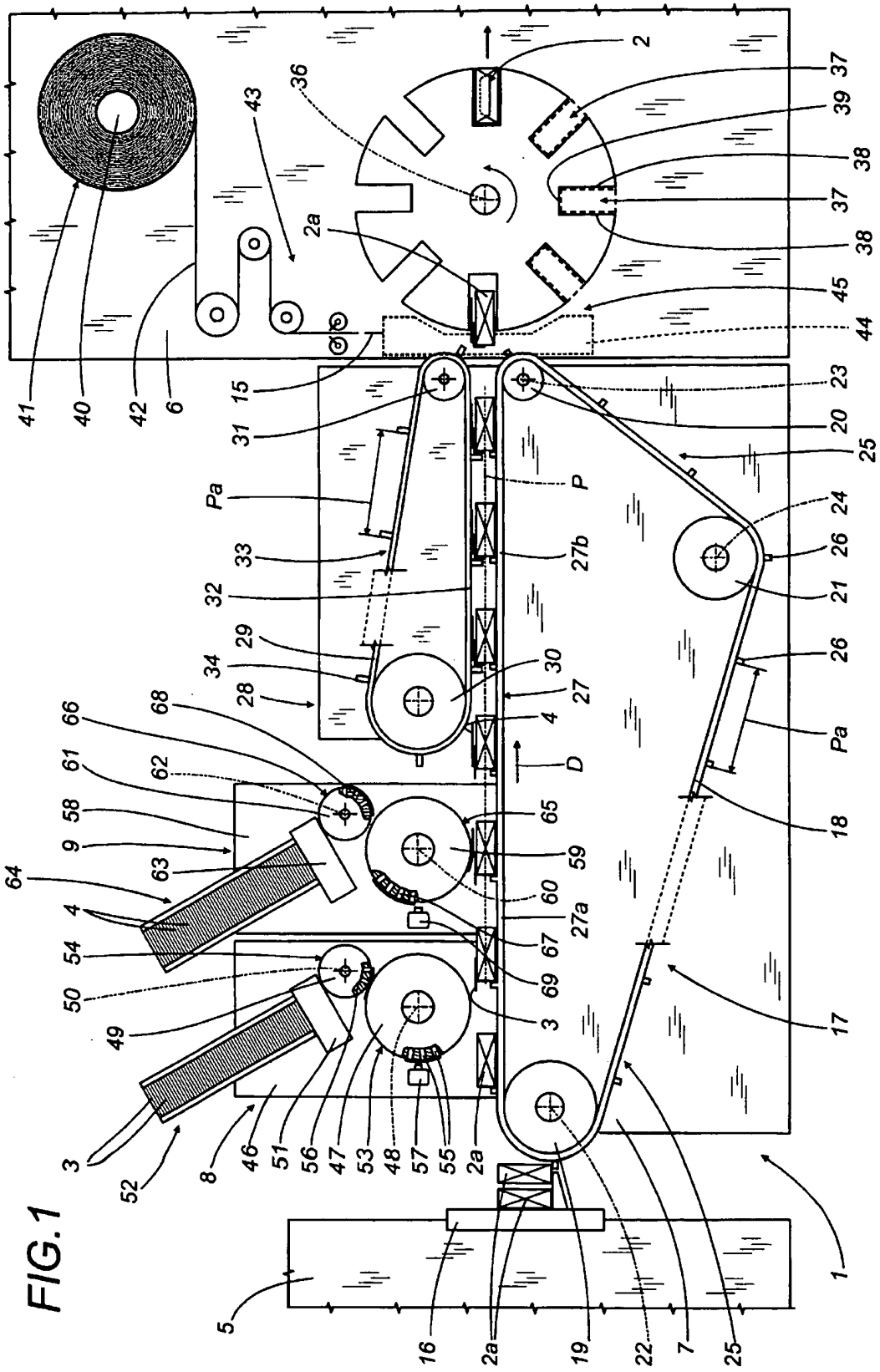

41
40
42
6
43
36
2
37
39
38
37
38
2a
45
44
15
31
23
20
25
Pa
P
24
26
33
27b
21
32
29
34
30
26
28
27
4
Pa
D
66
68
61
62
58
65
18
9
63
59
64
60
4
27a
54
67
69
50
3
17
49
3
52
8
46
51
56
47
53
48
57
55
2a
1
5
16
2a
19
22
7
25

FIG. 1

FIG.2

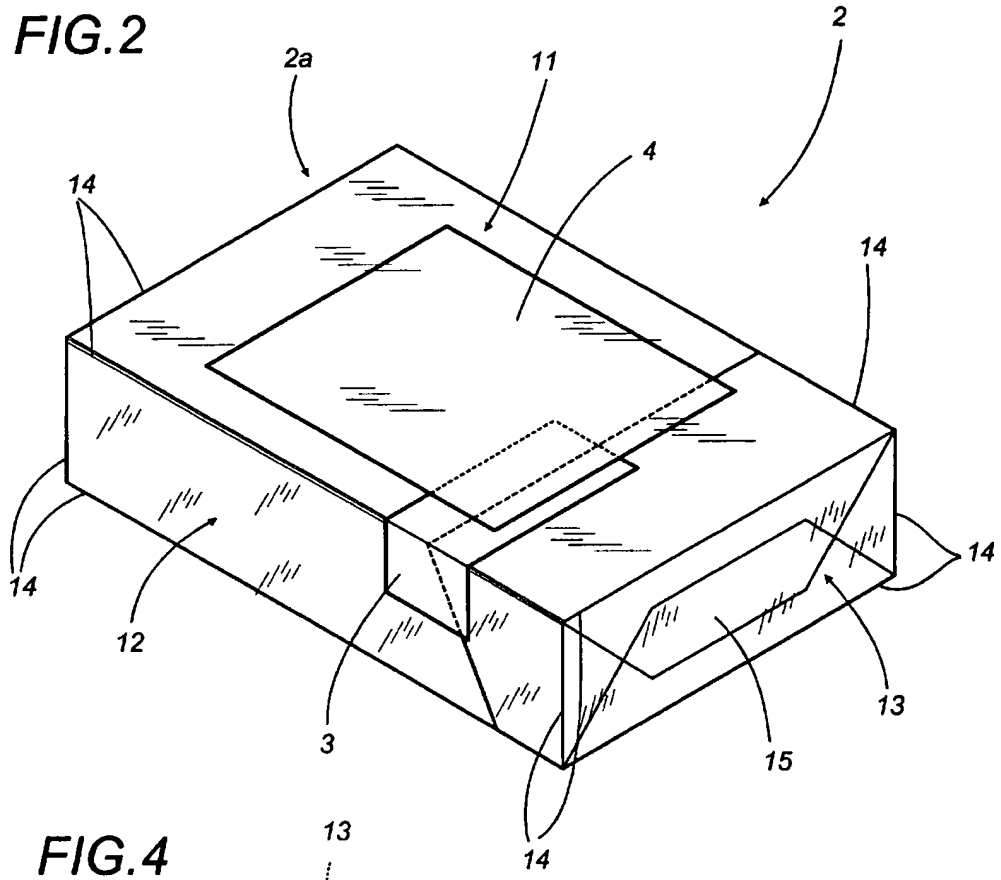
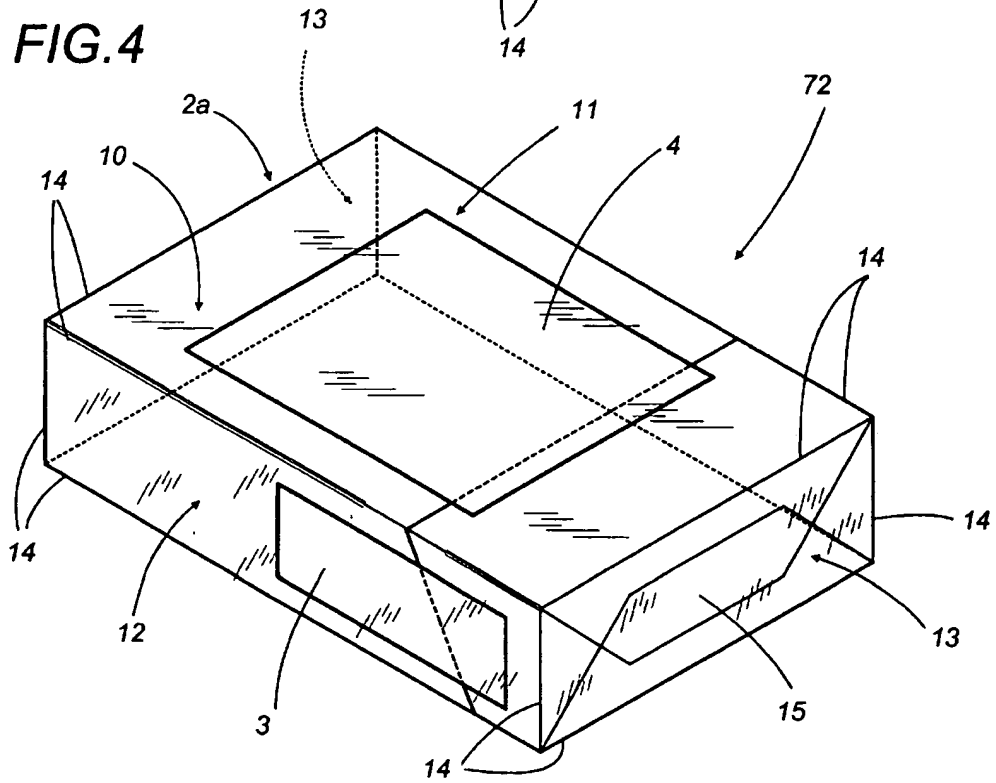

2
2a
11
4
14
14
14
14
12
3
13
15
14

FIG.4


13
2a
11
72
10
4
14
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12
3
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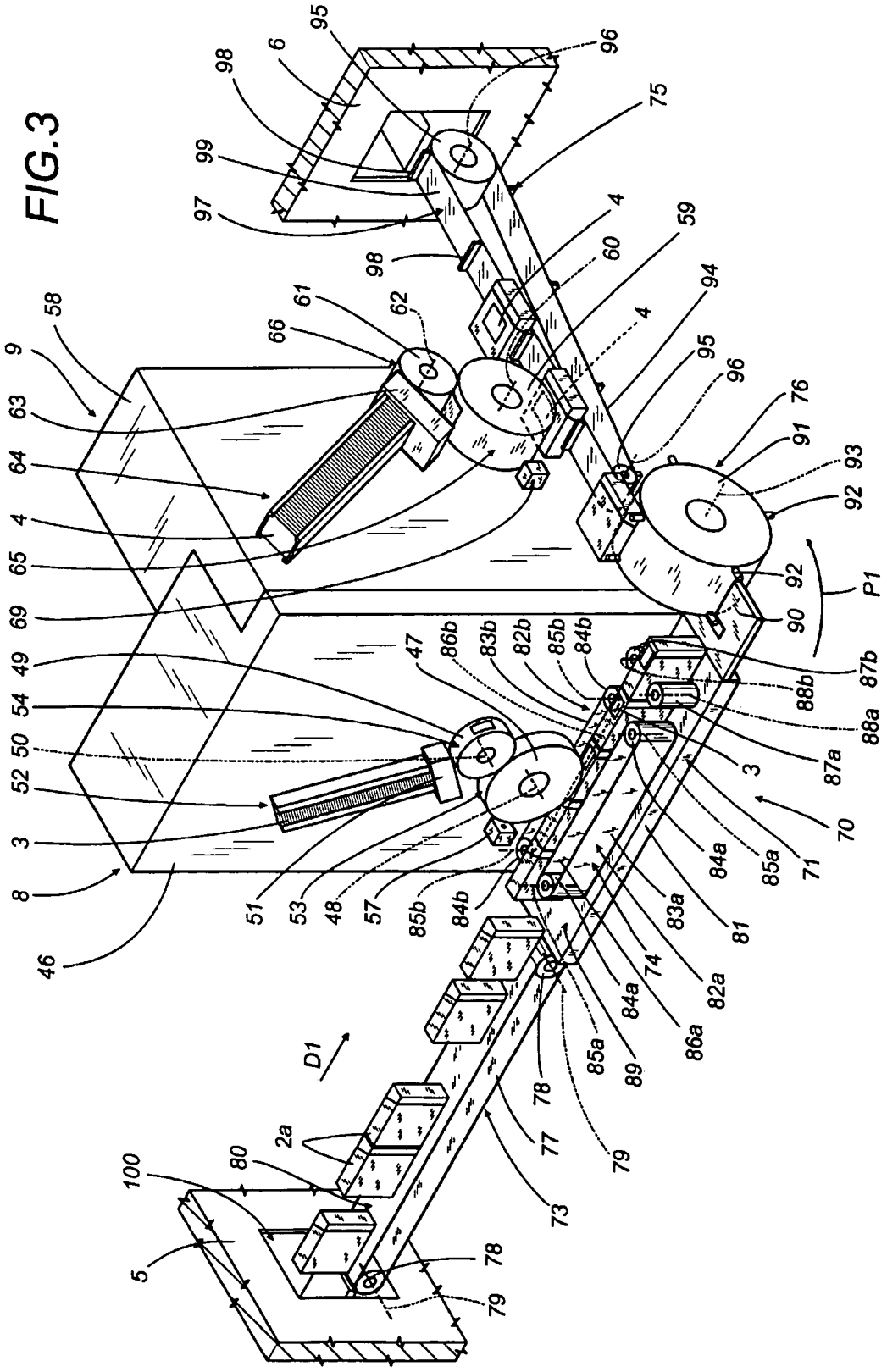
15
14

FIG.3


95
6
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62
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51
53
48
57
85b
84b
47
86b
83b
82b
85b
84b
87b
88b
88a
87a
3
70
71
84a
85a
83a
81
74
82a
86a
84a
85a
89
78
79
77
73
D1
2a
80
100
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78
79
4
95
96
76
91
93
92
92
90
P1

METHOD OF FASHIONING PACKETS OF CIGARETTES AND EQUIPMENT FOR THE IMPLEMENTATION OF SUCH A METHOD

BACKGROUND OF THE INVENTION

The present invention relates to a method of fashioning packets of cigarettes.

In particular, the present invention relates to a method by which to fashion sealed packets of cigarettes.

A typical packet of cigarettes is composed of an ordered group of cigarettes, a first sheet of soft and generally metal foil backed wrapping material enveloping the cigarettes, and a second sheet of soft wrapping material enveloping the first sheet; in this instance the packet produced is of the soft or crush type. Alternatively, the second sheet of wrapping material can be a stiff material such as cardboard, procured in the form of a diecut blank which is folded about the first wrapper to fashion a packet of the rigid type incorporating a hinged lid. The single packet of cigarettes, be it a crush or rigid type, is overwrapped in a relative sheet of transparent material, normally cellophane® or polypropylene, of which the folds are sealed to obtain a substantially airtight closure.

Packets of cigarettes are manufactured utilizing equipment that includes packaging machines, with stations by which the wrapping materials mentioned above are applied to and folded around the relative groups of cigarettes, and cellophaners comprising a feed station supplying single cellophane sheets, folding stations at which the sheets are wrapped around the packets, and sealing stations by which the folded cellophane sheets are secured.

In addition to these steps, it is customary in certain countries to affix a revenue stamp to each single packet of cigarettes before the cellophane overwrapping is applied. The stamp indicates that the packet is subject to a state excise duty in the country of sale, and remains visible through the transparent overwrapping.

Likewise in certain countries, it is the practice to insert a printed coupon into each packet. The coupon appears as a single leaf or fan-folded slip of paper, which might bear an advertising message or a collectable image, and is inserted normally between the first sheet of wrapping material and the second sheet or the cardboard blank, depending on the type of packet). It has been found that the product suffers damage when the coupon is placed in direct contact with the first sheet of wrapping material, since the inks on the printed face of the coupon give off vapors that affect the aroma of the tobacco.

Furthermore, the equipment employed typically to fashion packets with both the revenue stamp and a coupon is somewhat complex, as provision must be made for a coupon dispensing station in amongst the folding stations by which the sheets of wrapping material are flattened and secured.

Conventional packaging machinery is complicated by the inclusion of devices serving to dispense and insert the coupon, with the result that the single steps of the wrapping process are slowed down and the productivity of the system overall is reduced.

The object of the present invention is to provide a method for fashioning packets of cigarettes with respective revenue stamps and coupons and a sealed overwrapping, such as will be unaffected by the drawbacks associated with the prior art.

In particular, the object of the invention is to provide a method for fashioning sealed packets of cigarettes with corresponding revenue stamps and coupons such as can be implemented using notably simple equipment capable of high productivity.

SUMMARY OF THE INVENTION

The stated object is realized in a method as disclosed herein for fashioning sealed packets of cigarettes furnished with respective revenue stamps and respective coupons, which comprises the steps of assembling packets of cigarettes in a packaging machine, each presenting an outer surface afforded by an opaque wrapping material; transferring the packets of cigarettes directly from the packaging machine to a cellophaner; overwrapping the opaque wrapping material of each packet with a transparent material and securing the transparent material to fashion a sealed packet of cigarettes; applying a revenue stamp to the outer surface of each packet during the transfer step, and applying a coupon to the outer surface of each packet during the transfer step.

The present invention also relates to equipment for fashioning sealed packets of cigarettes..

Equipment according to the present invention for fashioning sealed packets of cigarettes, each with a respective revenue stamp and a respective coupon, comprises a packaging machine serving to assemble unsealed packets of cigarettes presenting an opaque wrapping material outermost; a cellophaner by which a transparent overwrapping material is applied over the opaque wrapping material of each packet in turn to form a respective sealed packet of cigarettes; a device by which unsealed packets of cigarettes are transferred directly from the packaging machine to the cellophaner; also a device by which a revenue stamp is applied to each packet of cigarettes and a device by which a coupon is applied to each packet of cigarettes.

To advantage, the device for applying the revenue stamps and the device for applying the coupons are positioned along the transfer device.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in detail, by way of example, with the aid of the accompanying drawings, in which:

FIG. **1** illustrates equipment for implementation of the method according to the present invention, in a first solution, viewed in a side elevation and with parts omitted for clarity;

FIG. **2** illustrates a packet of cigarettes fashioned using the equipment of FIG. **1**, seen in perspective;

FIG. **3** illustrates equipment for implementation of the method according to the present invention, in a second solution, viewed in perspective and with parts omitted for clarity;

FIG. **4** illustrates a packet of cigarettes fashioned using the equipment of FIG. **1**, seen in perspective.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. **1** of the drawings, **1** denotes equipment by means of which to fashion sealed packets **2** of cigarettes, each with a respective revenue stamp **3** and a respective coupon **4** or advertising leaflet. The equipment **1** comprises a packaging machine **5**, a cellophaner **6** connected to the packaging machine **5** by way of a transfer device **7**, and located along the transfer device, a device **8** for dispensing and affixing the revenue stamps **3** and a device **9** for dispensing and affixing the coupons **4**.

As discernible to advantage in FIG. **2**, the sealed packet **2** of cigarettes comprises a packet **2***a* of which the outer surface **10**, in the unsealed state, consists of an opaque

wrapping material; the packet is parallelepiped in shape, exhibiting two larger faces **11**, two flank faces **12**, two end faces **13** and twelve edges **14** along which the adjoining faces **11**, **12** and **13** are interconnected. The packet **2** carries a revenue stamp **3**, rectangular in shape, of which one portion is applied to a larger face **11** and the remaining portion to an adjoining flank face **12**; in effect, the stamp **3** is bent to a right angle and straddles the edge **14** by which the two faces **11** and **12** are interconnected. The coupon **4** is essentially rectangular, with dimensions smaller than those of the larger face **11**, and applied to the same face as that occupied by the stamp **3** in such a way that the stamp **3** is covered in part. Finally, the packet **2** of cigarettes comprises a sheet **15** of transparent cellophane enveloping the packet **2***a* and clinging to the outer surface **10**, to the revenue stamp **3** and to the coupon **4**.

The packaging machine **5** comprises an outfeed device **16** by which the packets **2***a* are directed from this same machine **5** to the transfer device **7**.

The transfer device **7** comprises a belt conveyor **17** that extends from the packaging machine **5** to the cellophaner **6** and consists in a belt **18** looped over pulleys **19**, **20** and **21** rotatable about respective axes **22**, **23** and **24** disposed normal to the viewing plane of FIG. **1**. The belt **18** affords a succession of pockets **25** distributed evenly at a given pitch Pa along its developable length, delimited by slats **26** disposed transversely to the longitudinal axis of the developable face. The looped belt **18** comprises an active branch **27** extending along a substantially horizontal feed direction D, which is composed of a portion **27***a* lying nearer to the packaging machine **5** and a portion **27***b* nearer to the cellophaner **6**. The transfer device **7** also comprises a belt conveyor **28** located above the conveyor denoted **17**, consisting in a belt **29** looped over two pulleys **30** and **31** and presenting an active branch **32** parallel with and facing the aforementioned portion denoted **27***b*. This belt **29** likewise affords a succession of pockets **33** distributed evenly along its developable length, at the same pitch Pa as the pockets denoted **25**, which are delimited by slats **34** disposed transversely to the longitudinal axis of the developable face.

The cellophaner **6** comprises a wrapping wheel **35** rotatable about an axis parallel to the axes **22**, **23** and **24** of the pulleys, which exhibits a plurality of pockets **37** each affording two mutually opposed side walls **38** and a back wall **39** and proportioned to accommodate a single packet **2***a* of cigarettes. In addition, the cellophaner **6** comprises a support **40** carrying a roll **41** of cellophane strip **42**, and a device **43** by which the strip **42** is decoiled and divided into single sheets **15**, also a device **44** by which the cut sheets **15** of cellophane are conveyed toward a folding station **45** disposed between the belt conveyor **17** and the wrapping wheel **35**, and by which the packets **2***a* are directed from the transfer device **7** into the pockets **37** of the wheel in such a manner that each will intercept a relative sheet **15** before entering the respective pocket **37**.

The devices **8** and **9** for dispensing and affixing the revenue stamps **3** and coupons **4** are disposed in succession, relative to the feed direction D, along and above the initial portion **27***a* of the active branch **27**. The first device **8** comprises a frame **46**, supporting an applicator drum **47** rotatable about an axis **48** perpendicular to the viewing plane of FIG. **1** and lying above the initial portion **27***a* of the active branch **27**, and a take-up drum **49** rotatable substantially tangential to the applicator drum **47** about an axis denoted **50**, located adjacent to a device **51** by which the stamps **3** are extracted from a magazine **52**. More exactly, the drums **47** and **49** present respective cylindrical surfaces **53** and **54** affording respective uniformly distributed suction holes **55** and **56** by which the stamps **3** are retained during their transfer from the magazine **52** to the packet. The frame **46** also carries a gumming device **57** positioned at a point alongside the cylindrical surface **53** of the applicator drum **47**, by which an adhesive substance is applied to each successive stamp **3**.

In like manner, the coupons **4** are dispensed and affixed by a device **9** that comprises a frame **58**, supporting an applicator drum **59** rotatable about an axis **60** perpendicular to the viewing plane of FIG. **1** and positioned above the initial portion **27***a* of the active branch **27**, and a take-up drum **61** rotatable substantially tangential to the applicator drum **59** about an axis denoted **62**, located adjacent to a device **63** by which the coupons **4** are extracted from a magazine **64**. These drums **59** and **61** also present respective cylindrical surfaces **65** and **66** affording respective uniformly distributed suction holes **67** and **68** by which the coupons **4** are retained during their transfer from the magazine to the packet. The frame **58** carries a gumming device **69** positioned at a given point alongside the cylindrical surface **65** of the applicator drum **59**, by which an adhesive substance is applied to each successive coupon **4**.

In operation the unsealed packets **2***a* are released in succession from the outfeed device **16** of the packaging machine **5** onto the active branch **27** of the belt conveyor **17** and taken up by the respective pockets **25** disposed with one face **11** flat against the surface of the belt **18** and the two end faces **13** parallel to the feed direction D. Each individual packet **2***a* occupies a corresponding pocket **25** and advances continuously in the feed direction D along a predetermined path P toward the cellophaner **6**, carried by the belt **18** and by a respective slat **26**.

As the packets advance, the first dispensing and affixing device **8** directs the revenue stamps **3** in ordered succession toward the packets **2***a* occupying the respective portion **27***a* of the active branch **27**. The extractor device **51** takes the stamps **3** one at a time from a stack loaded into the magazine **52** and offers them to the cylindrical surface **54** of the take-up drum **49**, on which they are retained each in turn by a corresponding suction hole **56**. Thus, the stamps **3** are transferred in an ordered succession from the magazine **52** to the suction holes **56** of the take-up drum **49**, thence to the suction holes **55** of the applicator drum **47**. The stamps **3** are rotated by this same drum **47** in an counterclockwise direction, as viewed in FIG. **1**, and transferred ultimately to the respective packets **2***a* of cigarettes. During the course of the transfer, the stamps **3** are conveyed past the gumming device **57**, which will deposit the adhesive substance on each one.

The suction holes **55** of the applicator drum **47** are spaced at the same pitch Pa as the pockets **25** of the conveyor **17** and timed also with the pockets in such a way that a portion of the stamp **3** will be affixed to the upwardly directed larger face **11** of each packet **2***a*. Once the stamp **3** has been attached, the relative packet **2***a* advances toward the coupon dispensing device **4** with the unaffixed portion of the stamp **3** projecting freely.

In like manner the second dispensing and affixing device **9** proceeds to direct the coupons **4** in an ordered succession toward the packets **2***a* lying on the initial portion **27***a* of the active branch **27**. The extractor device **63** takes the coupons **3** one at a time from a stack loaded into the magazine **64** and offers them to the cylindrical surface **66** of the take-up drum **61**, on which they are retained each in turn by a corresponding suction hole **68**. Thus, the coupons **4** are transferred in

an ordered succession from the magazine **64** to the suction holes **68** of the take-up drum **61**, thence to the suction holes **67** of the applicator drum **59**. The coupons **4** are rotated by the drum **59** in an counterclockwise direction, as viewed in FIG. **1**, and transferred ultimately to the respective packets **2***a* of cigarettes. During the course of the transfer, the coupons **4** are conveyed past the gumming device **69**, which will deposit the adhesive substance on each one.

The suction holes **67** of the applicator drum **59** are spaced at the same pitch Pa as the pockets **25** of the conveyor **17** and timed with the pockets in such a way as to affix the coupon **4** to the upwardly directed larger face **11** of each packet **2***b*, covering the stamp **3** in part. After each coupon **4** has been affixed, the relative packet **2***a* advances toward the cellophaner **6** together with the coupon **4** and the partially affixed stamp **3**.

The packets **2***a* are now advanced along the portion of the active branch **27** denoted **27***b*, the downwardly directed larger face **11** in contact with the one belt **18** and the upwardly directed larger face **11** in contact with the belt **29** above. In other words, a packet **2***a* advancing along this same portion **27***b* of the active branch **27** occupies both the pocket **25** of the bottom conveyor **17** and the pocket **33** of the top conveyor **28**, and is pushed in the feed direction D by the slats **26** and **34** of both belts. The slats **34** of the top belt are set at the same pitch Pa as the slats **26** of the bottom belt, and their movement is timed with that of the bottom slats in such a way that each top slat **34** will align vertically with a bottom slat **26** and flatten the projecting portion of the revenue stamp **3** against the flank face **12** of the packet **2***a*, maintaining it in this position as the packet **2***a* advances toward the cellophaner **6**.

A sheet **15** of overwrapping material is advanced by the cellophaner **6** toward the folding station **45**, that is to say between the runout end of the active branch **27** and the wrapping wheel **35**, and held there in a position transverse to the feed direction D. The wheel **35** pauses intermittently, offering each pocket **37** in turn to the station **45** with the two side walls **38** aligned respectively on the active branch **27** of the bottom belt **18** and on the active branch **32** of the top belt **29**. During the pause, a packet **2***a* now complete with the revenue stamp **3** and the coupon **4** will be directed into the pocket **37** waiting at the folding station **45**. As the packet **2***a* passes from the transfer device to the cellophaner, the sheet **15** is intercepted and forced initially to bend around the packet **2***a*, assuming a "U" profile. The wheel **35** then rotates, carrying the packet **2***a* together with the revenue stamp **3**, the coupon **4** and now the overwrapping sheet **15**, which is folded and sealed by the cellophaner **6** in conventional manner (not illustrated) to fashion a sealed packet **2** of cigarettes as in FIG. **2**.

The equipment **70** in the example of FIG. **3** includes a packaging machine **5** and a cellophaner **6** disposed at right angles one to the other, a dispensing and affixing device **8** for the revenue stamps **3** and a dispensing and affixing device **9** for the coupons **4** also disposed at right angles one to another, and a transfer device **71** by which the unsealed packets **2***a* are conveyed from the packaging machine **5** to the cellophaner **6** along a path denoted P1.

This device **71** is employed in fashioning a sealed packet **72** of cigarettes which, as illustrated to advantage in FIG. **4**, comprises a packet **2***a* with a revenue stamp **3** affixed along one flank face **12** and a coupon **4** affixed to one larger face **11**, which is overwrapped in a sheet **15** of cellophane.

The transfer device **71** comprises a first belt conveyor **73** positioned downline of the packaging machine **5**, a second conveyor **74** positioned downlime of and in longitudinal alignment with the first, a further conveyor **75** positioned directly upline of the cellophaner **6** and transversely to the second conveyor **74**, and a flipper wheel **76** located between the latter two conveyors **74** and **75**.

The first conveyor **73** comprises a belt **77** looped over two pulleys **78** rotatable about respective substantially horizontal axes **79**, and affords an active branch **80** along which the packets **2***a* of cigarettes are caused to advance in a predetermined feed direction D1.

The second conveyor **74**, which follows this same feed direction D1, comprises a platform **81** and, extending along a portion of the platform, a pair of belt conveyors **82***a* and **82***b* disposed facing and parallel with one another. Each such conveyor **82***a* and **82***b* comprises a respective belt **83***a* and **83***b* looped over a relative pair of pulleys **84***a* and **84***b* rotatable respectively about substantially vertical axes **85***a* and **85***b* orthogonal to the axes **79** of the pulleys **78** mentioned above. The conveyors **82***a* and **82***b* further comprise respective active branches **86***a* and **86***b* set parallel and mutually opposed, between which the single packet **2***a* is gripped by its two opposite larger faces **11**. Also forming part of the conveyor **74** are two rollers **87***a* and **87***b* occupying a portion of the platform **81** beyond the two belt conveyors **82***a* and **82***b*, disposed facing and parallel with one another and rotatable about respective vertical axes **88***a* and **88***b*. The platform **81** affords a surface **89** along which the packets **2***a* are caused to advance by the belt conveyors **82***a* and **82***b* and the rollers **87***a* and **87***b* toward a shelf denoted **90**. The shelf **90** is aligned with the platform **81** and disposed adjacent to the flipper wheel **76**, which appears as a drum **91** equipped with pairs of arms **92** distributed uniformly about the cylindrical surface of revolution and rotatable about a horizontal axis denoted **93**. The two arms **92** of each pair are set at a given distance one from another, the width of the shelf **90** being compassed freely between the arms **92** of each pair.

The conveyor denoted **75** runs between the flipper wheel **76** and the cellophaner **6** and consists in a belt **94**, looped over two pulleys **95** rotatable about substantially horizontal respective axes **96**. The belt **94** is embodied with a succession of pockets **97** distributed uniformly along its developable surface and delimited by respective slats **98**, and affords a substantially horizontal active branch **99**.

100 denotes the outfeed device of the packaging machine **5**, from which the packets **2***a* are directed onto the first conveyor **73** with one flank face **12** resting on the active branch **80**.

The revenue stamps **3** are dispensed by a relative device **8** positioned above the second conveyor **74** and directly over the belt conveyors **82***a* and **82***b*, in such a way as to affix a stamp **3** to a relative packet **2***a* advancing between the belts **83***a* and **83***b*, whilst the coupons **4** are dispensed by a device **9** disposed above the transverse conveyor **75** in such that a coupon **4** can be affixed to each packet **2***a* advancing along the active branch **97**.

In operation, unsealed packets **2***a* are directed by the outfeed device **100** of the packaging machine **5** onto the active branch **80** of the first conveyor **73** and advanced along the feed direction D1 toward the second conveyor **74**, proceeding at a predetermined first velocity V1. The packets **2***a* are taken up in succession between the mutually opposed vertical conveyors **82***a* and **82***b*, their larger faces **11** in contact with the active branches **86***a* and **86***b* of the two belt loops, and advanced along the platform **81** at a velocity V2 lower than the first velocity V1. In this way, the packets **2***a*

are decelerated and ordered along the conveyors **82***a* and **82***b* with their corresponding end faces **13** breasted in contact one with another.

More exactly, the packets **2***a* advance between the two mutually opposed conveyors **82***a* and **82***b* disposed with one flank face **12** offered to the surface **89** of the platform **81**, the larger faces **11** offered to the belts **83***a* and **83***b*, and the remaining flank face **12** offered upwards in readiness to receive a stamp **3**. The revenue stamp **3** is dispensed and affixed in the same manner as described already for the embodiment of FIG. **1**.

As the stamps **3** are affixed, the packets **2***a* are accelerated by the rollers **87***a* and **87***b*, distanced one from the next as a result, and advanced singly and in succession onto the shelf **90** where each one pauses in turn. The rotation of the wheel **76** brings each pair of arms **92** into contact with a packet **2***a* occupying the shelf **90**, whereupon the packet **2***a* is taken up and transferred to a pocket **97** of the next conveyor **75** by the action of the arms **92**, which are located on either side of the relative belt **94** in order to avoid contact between the wheel **76** and the conveyor **75**. The packets **2***a* are flipped during the resulting transfer movement in such a way that each is released into a pocket **97** of the conveyor **75** with one larger face **11** offered to the surface of the belt **94**. As the packets **2***a* advance along the conveyor **75**, a coupon **4** is applied to the upwardly directed face **11** of each one in the manner already described for the embodiment of FIG. **1**.

What is claimed:

1. A method for fashioning sealed packets of cigarettes furnished with respective revenue stamps and respective coupons, comprising the steps of assembling packets of cigarettes in a packaging machine, each presenting an outer surface afforded by an opaque wrapping material; transferring the packets of cigarettes directly from the packaging machine to a cellophaner; overwrapping the opaque wrapping material of each packet with a transparent material and securing the transparent material to fashion a sealed packet of cigarettes; applying a revenue stamp to the outer surface of each packet during the transfer step, and applying a coupon to the outer surface of each packet during the transfer step.

2. A method as in claim **1**, wherein the outer surface comprises two parallel and opposite larger faces, two parallel and opposite flank faces and two parallel and opposite end faces, and the coupon is applied to a first of the two larger faces.

3. A method as in claim **2**, wherein the revenue stamp is applied in part to the first larger face and in part to a first flank face adjoining the first larger face, by affixing a first portion initially to the first larger face then bending and flattening the remaining portion against the first flank face.

4. A method as in claim **2**, wherein the revenue stamp is applied in its entirety to a first flank face adjoining the first larger face.

5. A method as in claim **2**, wherein the revenue stamp is applied at least in part to the first larger face of the packet of cigarettes.

6. A method as in claim **5**, wherein the revenue stamp is covered by the coupon at least in part.

7. A method as in claim **5**, wherein the revenue stamp is applied in part to the first larger face and in part to a first flank face adjoining the first larger face, by affixing a first portion initially to the first larger face then bending and flattening the remaining portion against the first flank face.

8. A method as in any one of claims **1** to **4** or **7**, wherein the step of applying the revenue stamp precedes the step of applying the coupon.

9. Equipment for fashioning sealed packets of cigarettes each with a respective revenue stamp and a respective coupon, comprising a packaging machine such as will assemble unsealed packets of cigarettes presenting an opaque wrapping material outermost; a cellophaner by which a transparent overwrapping material is applied over the opaque wrapping material of each packet in turn to form a respective sealed packet of cigarettes; a device by which the unsealed packets of cigarettes are transferred directly from the packaging machine to the cellophaner; also a device by which a revenue stamp is applied to each packet of cigarettes and a device by which a coupon is applied to each packet of cigarettes, wherein the device for applying the revenue stamps and the device for applying the coupons are positioned along the transfer device.

10. Equipment as in claim **9**, wherein the transfer device comprises a first rectilinear conveyor extending from the packaging machine to the cellophaner and presenting a first belt that affords a first active branch above which the device for applying the stamps and the device for applying the coupons are stationed.

11. Equipment as in claim **10**, wherein the first conveyor is disposed adjacent to a wrapping wheel forming part of the cellophaner, in such a way that packets of cigarettes advancing along the conveyor can be transferred directly to the wheel.

12. Equipment as in claim **11**, wherein the transfer device comprises a second conveyor located above the first conveyor and adjacent to the wrapping wheel.

13. Equipment as in claim **12**, wherein the transfer device comprises a first rectilinear conveyor presenting a first belt affording a substantially horizontal active branch, and a second conveyor presenting a second belt affording a second active branch disposed parallel to the first active branch and in such a way that the packets of cigarettes are gripped between the first and second active branches.

14. Equipment as in claim **13**, wherein the first conveyor comprises a plurality of first pockets distributed along the first belt at a predetermined pitch, the second conveyor comprises a plurality of second pockets distributed along the second belt, and the first and second pockets are timed in such a way as to align one with another when advancing along the respective first and second active branches.

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